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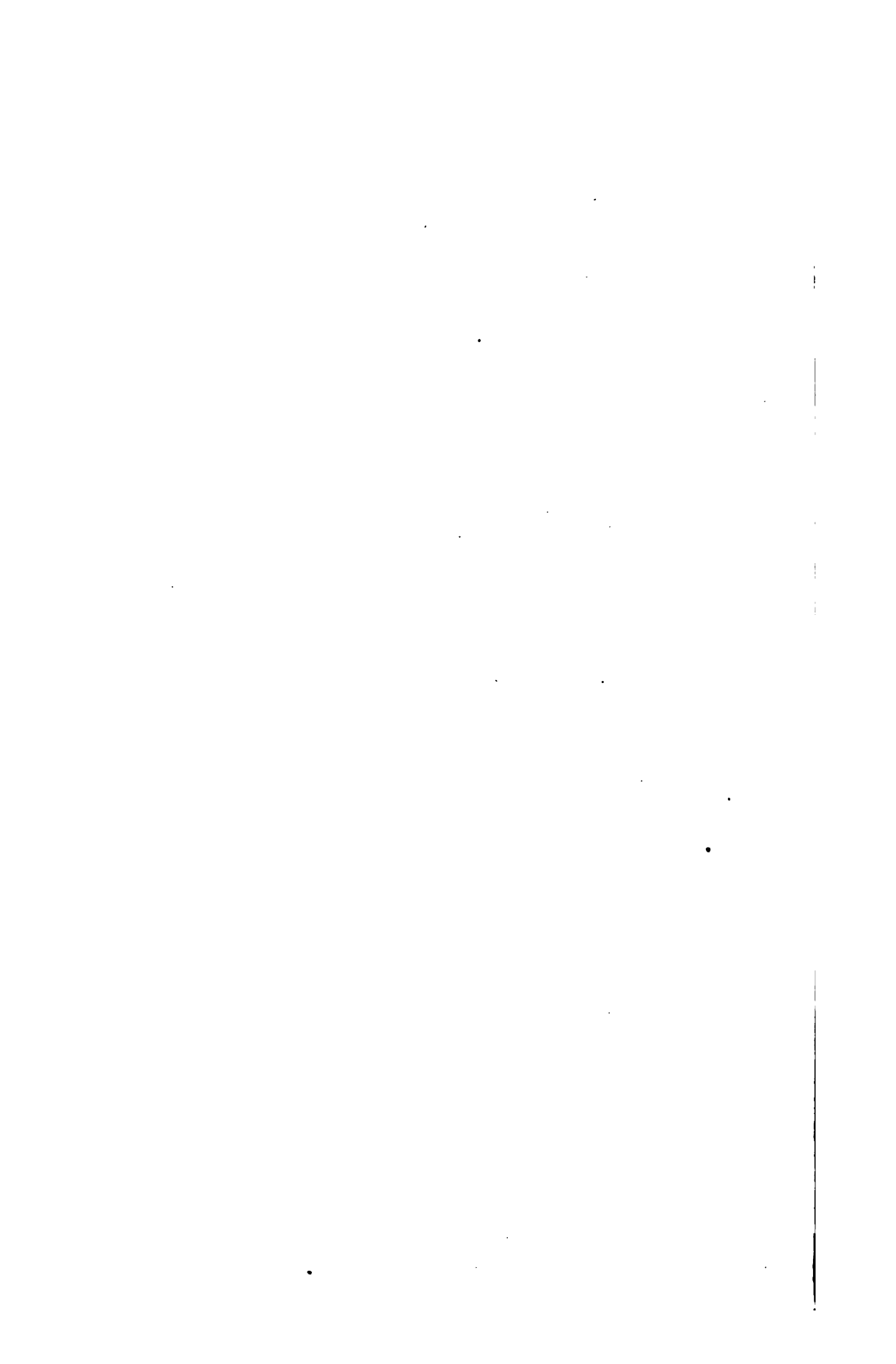
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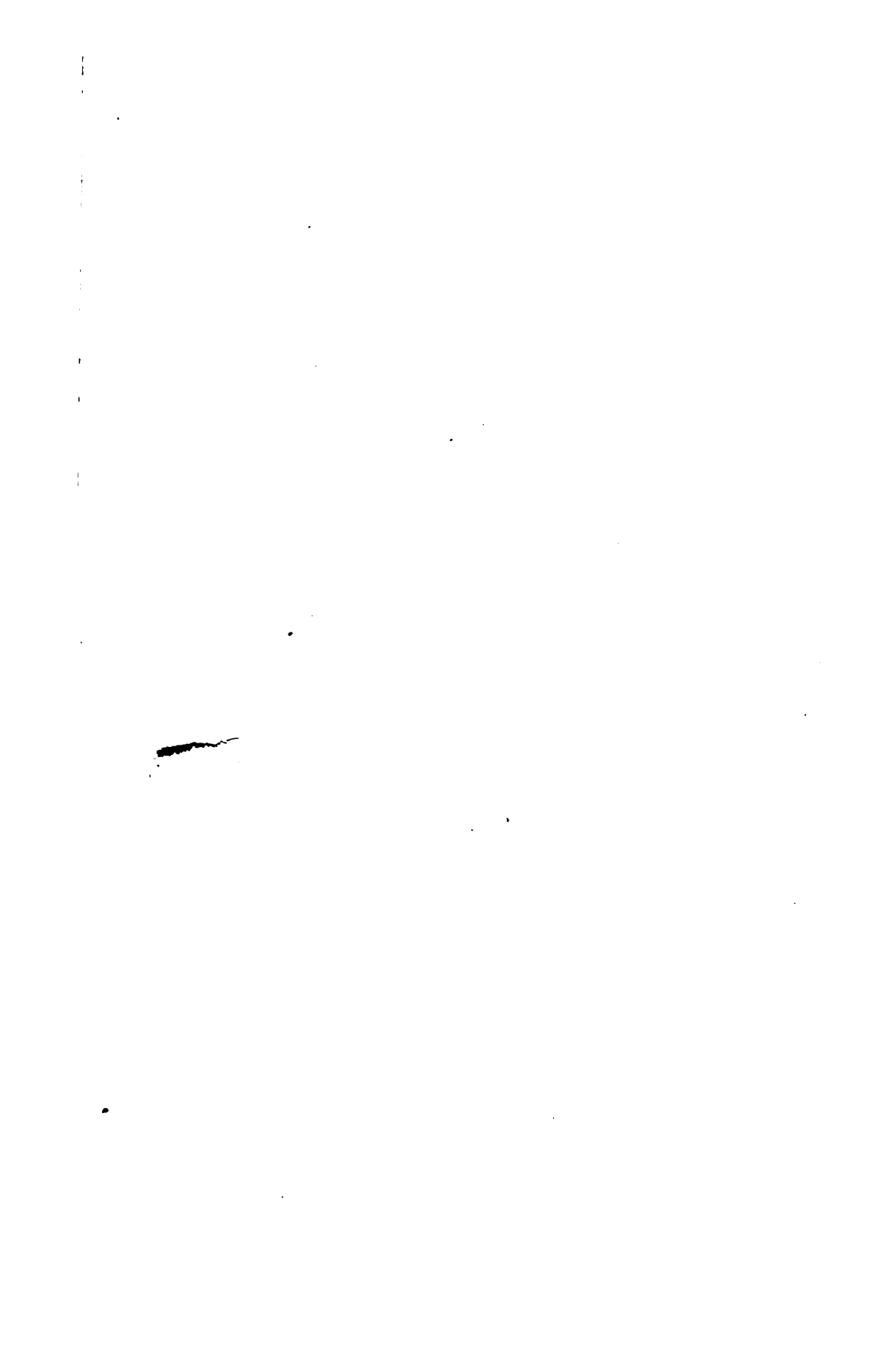


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Naval Policy of the United States

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HEARINGS

BEFORE THE

COMMITTEE ON NAVAL AFFAIRS

HOUSE OF REPRESENTATIVES

SIXTY-SIXTH CONGRESS

THIRD SESSION

ON

NAVAL POLICY OF THE UNITED STATES

INCLUDING DISCUSSIONS ON—

LIMITATION OF ARMAMENTS

NAVAL BUILDING PROGRAM, WITH COMPARISONS OF
VARIOUS TYPES OF SEACRAFT AND AIRCRAFT

DEVELOPMENT OF AVIATION AND THE NEED FOR AIR-
PLANE CARRIERS IN THE NAVY

AIR BOMBING OF THE U. S. S. "INDIANA"

THE PROPOSAL FOR A UNITED AIR SERVICE



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COMMITTEE ON NAVAL AFFAIRS,

HOUSE OF REPRESENTATIVES.

SIXTY-SIXTH CONGRESS, THIRD SESSION.

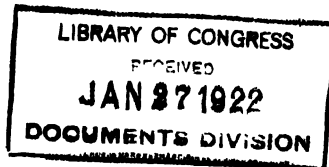
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II



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[No. 12.]

NAVAL POLICY OF THE UNITED STATES.

Including Discussions on—

Limitation of Armaments.

Naval Building Program, with Comparisons of Various Types of Seacraft and Aircraft.

Development of Aviation and the need for Airplane Carriers in the Navy.

Air Bombing of the U. S. S. "Indiana."

The Proposal for a United Air Service.

Hearings before the

COMMITTEE ON NAVAL AFFAIRS, HOUSE OF REPRESENTATIVES,

Friday, February 4, 1921.

The committee met at 10.30 o'clock a. m., Hon. Thomas S. Butler, chairman, presiding, having before it for a discussion of the naval policy of the United States and kindred subjects, the following witnesses: Rear Admiral W. S. Sims, president of the United States Naval War College; Rear Admiral Bradley A. Fiske, retired; Admiral R. E. Coontz, Chief of Naval Operations; Rear Admiral Charles J. Badger, chairman, executive committee of the Navy General Board, and other members of the General Board; and Brig. Gen. William Mitchell, Assistant Chief of the Air Service, United States Army.

Statement of **REAR ADMIRAL W. S. SIMS**, President of the United States Naval War College, Newport, R. I.

DISARMAMENT.

The CHAIRMAN. Admiral Sims, the General Board has submitted an estimate for \$107,000,000 worth of ships to round out our fleet. That estimate has not been approved by the Secretary of the Navy, but nevertheless, it appears here before us and we will have to dispose of it. We have made some inquiry touching a question that is agitating the public very greatly just now, and that is the question of the attempt to be made among the nations to limit armament. It is not necessary to indicate to an officer like yourself anything further as to what we have in our minds. We would like very much to have your views in regard to the probable success of such a movement. So far as I am concerned, there is nothing else in my mind at this time to suggest to you. You have had a great deal of experience

abroad and have come in close touch with foreigners, and I think your opinion upon that subject would be very valuable to the committee. We will be indebted to you if you will give it to us.

Admiral SIMS. Yes, sir, Mr. Chairman. It seems to me, from what I know of the attitude of the people on the other side, that they feel an impelling necessity to decrease the expense that they have been put to heretofore in the matter of providing armaments.

The CHAIRMAN. Right there, Admiral, please be kind enough to state just what relation you had to the American Government during the war and what your command was when you were abroad. Of course, all of us on the committee are familiar with your career and your performances, but your statement to-day may go out to the public, and I think it is important that your statement should show the facts I have indicated, because it will show what opportunities you have had to obtain knowledge and information upon this subject.

Admiral SIMS. My opportunity for coming into contact with the people on the other side was due to the fact that I was in command of the American naval forces, both on land and on sea, that were operating on the other side. Those forces were distributed all the way from the Adriatic Sea to the White Sea, and it was a part of my duty to meet the leaders of the various navies concerned—that is to say, the chiefs of staff of the British, the French, and Italian navies, and the representatives of the Japanese Navy—in continual conferences, sometimes in Rome, sometimes in Paris, and sometimes in London, and I was frequently in communication with the governing authorities of those countries, principally the ministers of marine, or the secretaries of the navies, of those countries. On other less formal occasions I was in contact with the prime ministers. I met them frequently at more or less informal dinners, with anywhere from 8 to 20 persons present.

Those things were continually discussed, and one of the commonest remarks made was that when we should get done with this war we will all be pretty faulty if we can not find some means by which we can get along peaceably in the world and safely without the enormous expenditures of a country like France, which needed a great Army to protect itself from invasion from the east, and countries like Great Britain, needing protection on the sea. Of course, everybody recognizes that Great Britain's building program was dependent entirely upon the building program of a possible enemy, which was Germany. Germany, as you know, upon one occasion, refused to enter upon a naval holiday, because they insisted that they wanted a place in the sun, and they would not stop, though they seriously menaced the British fleet. From my intercourse with those people, I do not hesitate to say that the sentiment is very strong in favor of doing something to get rid of this enormous expense. I think that is true to-day with France; if any arrangement could be made by which they would not be obliged to keep up great armaments, and it is the same way with Great Britain. Everybody knows what their financial condition is, and how much money they owe us and other people. They do not want to have to go into a building program again if they can help it.

Mr. BRITTEN. What do they see on the horizon that necessitates their promoting a large building program?

Admiral SIMS. As to that question that you ask, I am a naval officer who has not the necessary information from which to form a

really proper opinion. That is a question of governmental policy, and I should say that the only persons who have accurate information on that subject would be those who are responsible for our policy, and those who know intimately what our present relations with those other countries are. A naval officer is a military man who has no business at all with the policies of his Government. He can have opinions about them, but he has nothing to do with the forming of them. If you can tell me what the relations of this country are to-day with other countries, with a view to arriving at the probability of trouble, or, in other words, if you could define who our possible enemies are, or who our probable enemies are, and then inform us as to what the policy of this Government is, whether for an open door, or this, that, and the other thing, I could give an opinion; but based upon that, and only based upon that, can an intelligent opinion be formed as to what we ought to do and as to what other people ought to do. Now, as I look at this matter, Great Britain was forced into her building program on account of the menace of Germany, and all of you will remember that when we were applicants before you for an increase of our Navy, the argument put forward was that we wanted to be at least as strong as Germany. In those days there was no question of our building as strong a fleet as Great Britain. Sometimes it was said that we ought to be as strong as Germany and Japan. Now, the German Navy has disappeared, and that argument is not good any more.

Mr. BRITTEN. You are speaking for the General Board of the Navy, I presume, and my impression for the last 8 years has been that there has been considerable sentiment in the Navy and the General Board for a navy equal to any other.

Admiral SIMS. There has been, yes; but that has come up here in comparatively recent times. Now, it is, of course, a question for you gentlemen to decide as to whether that is necessary with a navy that is built for only one purpose. Statements are frequently made that a navy is for the purpose of policing the seas. That is an expression which has absolutely no meaning at all. The only policing of the seas that is necessary can be done by vessels of very small power. A navy is built for only one purpose; and that is to fight an enemy, or to carry out aggression against an enemy, and to defend yourself against his aggression. There is no other possible reason for it at all. If you can determine who your probable enemies are, then your safety requires that you have a fleet at least adequate to protect yourself against aggression from them. There is no other reason at all. I do not see why it is a thing about which there should be any pussy footing. If in connection and conjunction with our President and State Department, you believe from the information before you, that we are in more or less imminent danger of getting into armed conflict with Great Britain, or with Great Britain and Japan combined, then you want a strong navy.

Mr. BRITTEN. Suppose, on the other hand, there was nothing on the horizon that threatened us from any source, so far as our diplomatic and commercial relations were concerned, would you advocate the abandonment of the Navy?

Admiral SIMS. No, sir; I would not advocate the abandonment of the Navy, because you can not tell what will turn up, even though

we are not a nation of conquest. I agree with what Gen. Pershing said the other day—that is, that it is unthinkable that we should go to war with Great Britain—but, of course, you can not tell what will take place in the future. Looking forward a good many years in the future, you can not tell what will come out of central Europe.

Mr. OLIVER. I understood that this inquiry was to be devoted largely to a discussion of the question as to types of ships and the relative value of airplanes and dreadnaughts.

Mr. BRITTEN. Your impression is slightly erroneous.

Mr. OLIVER. That was my understanding.

The CHAIRMAN. Going back to the first question, Admiral, in your judgment, if this Government makes a request for a convention of the powers having great armaments, for the purpose of discussing a limitation of those armaments, would that invitation be accepted?

Admiral SIMS. In my opinion the invitation would be accepted at once, because I think they all recognize that the danger of the German Navy and of German militarism has been put down. There is no longer any necessity, of course, for Great Britain to have the kind of fleet she has now, and if her fleet were cut in half and ours were cut in half and Japan's cut in half, the relative powers would be just the same. The same results would be achieved if they slowed down on building, and I think that those countries on the other side would welcome an invitation to discuss the whole matter.

The CHAIRMAN. Coming to the second question, in the event such a meeting should be held, do you believe that we would be justified in hoping that it would succeed?

Admiral SIMS. I think that probably something would come out of it.

The CHAIRMAN. May I ask you to define that a little further and explain fully what you mean by that? You say you think that something would come out of it; by that do you mean that something substantial in the way of an agreement would come out of it?

Admiral SIMS. I think something in the way of an agreement would come out of it.

The CHAIRMAN. That is, something in the way of a limitation of armaments?

Admiral SIMS. In the way of a limitation of armaments; yes, sir.

The CHAIRMAN. But not a complete abandonment of the navies?

Admiral SIMS. No, sir; nobody is ever going to take his hand off his gun. He will keep it in the house at any event.

NAVAL POLICY OF THE UNITED STATES.

Mr. PADGETT. Admiral, to be specific, do I understand that your idea is that the United States should be content to have a Navy second in position or first?

Admiral SIMS. That is a question that a naval officer is not competent to answer unless he has the information that I referred to awhile ago.

Mr. PADGETT. I am asking you to base your opinion upon the information that you have, or upon your individual opinion as to what should be the policy. Upon that basis, do you think the United States should have a second-class Navy or a first-class Navy?

Admiral SIMS. It is not a question in my mind of a second-class Navy or a first-class Navy. If we have no idea, as I understand we have not, and we never have had, of extending our territory, and have no policy of aggrandizement at all, then we do not need as large a Navy as our enemies that are 3,000 miles away. If you will refer to any competent writer, for instance, from Admiral Mahan up and down, you will see what I mean. I have a book of Mahan's—I am not quite sure of the name of the book, but I can find it for you, and you will see in there a discussion of the matter of the relative importance of the distance that your enemies are away from you. I do not hesitate to say that a British Navy twice as great as ours could not successfully carry out any aggression against our coast, particularly in view of the modern weapons that we have now. Without going into a discussion in detail, my opinion is this, that if the enemy nation is 3,000 miles away, they have not any ships at all that can come over here and go back again without being coaled. She has got to have a base on this side. She has no destroyers at all that can come across the ocean at anything like fleet speed, and they must have bases for them. There is no base on this side and there never will be one on this side adequate to take care of a fleet of that kind and keep it in repair. They could not maintain a fleet on this side and keep it in repair. Now, it is up to us to decide, if we want to be on the defensive and have no idea of going across the ocean with our fleet to attack anybody else, as to what size the fleet should be. That is not the sort of thing to get into a quarrel about, but it is something that must be gone carefully into by competent military people.

Mr. PADGETT. My question was this: Having in mind the entire geographical situation of this country, and of the rest of the countries of the world, their political condition, the governmental situation, and all questions that are related to the question of the needs, requirements, and necessities for a navy, I ask you now as a naval officer for an expression of your opinion as to what should be the policy of the United States—that is, should it be our aim to have a first-class Navy, or should we be content to have a second-class Navy?

Admiral SIMS. We should have a first-class Navy, but that does not necessarily mean, as I have just explained, that it ought to be as big as the navy that is 3,000 miles away.

Mr. PADGETT. I will put the question in a little different form: Would you be satisfied that the Navy should be second in power and in efficiency to any other navy in the world?

Admiral SIMS. I should not say second in efficiency to any navy of the world.

Mr. PADGETT. Second in military power?

Admiral SIMS. It wants to be as efficient in military power for all of our purposes, but that does not mean that it has to be equal in power to those on the other side.

Mr. PADGETT. You do not now advocate that the Navy of the United States should be equal in power, in military and fighting efficiency, ship for ship, to the navies of other countries?

Admiral SIMS. You are mixing two questions there. Our Navy must, of course, be as efficient as any other navy, ship for ship, and we will see to it that it is. There is no trouble about that. Your question, as I understand it, is whether I think it is necessary that our Navy should be greater than any other navy in the world.

Mr. PADGETT. Again, to be specific, do you think that the policy of the United States should be to have a Navy, in its aggregate of power and efficiency, first or second in rank?

Admiral SIMS. I think it should be sufficient for our purposes, and for this purpose is is not necessary that it should be as great in its aggregate power as that of the nation 3,000 miles away, and for the reasons I have stated.

Mr. PADGETT. Let me ask you if that is not a very substantial modification of the very convincing arguments you have submitted to this committee in years gone by?

Admiral SIMS. No, sir; I have never had any other opinion at all. When you say "you," do you mean me, or some of my—

Mr. PADGETT (interposing). My recollection is that you appeared before this committee and urged that we should build up a Navy that was not second to any navy in the world.

Admiral SIMS. Evidently what I meant was that it should not be second to any navy for our purposes. There has always been a purpose involved.

Mr. PADGETT. The words "for our purposes" have been incorporated for the first time in the record. This is the first time they have appeared in the record.

Admiral SIMS. I think this is the first time they have ever inquired into it with sufficient detail to bring that out.

Mr. BRITTEN. Carrying the point of your suggestion just a little further, you stated that our Navy need not necessarily be as large as the navy of some power across the sea. That applies, of course, to Japan as well as to Great Britain?

Admiral SIMS. Yes, sir.

Mr. BRITTEN. Would you be satisfied to have our Navy go back to a position below the Japanese Navy because of the distance between the United States and Japan on the Pacific side?

Admiral SIMS. In order to answer that question, you have got to tell me what the policy is. You ask me to form an opinion here upon policies that I am not acquainted with. If it is necessary that that Navy should be used in order to carry out certain policies—that is to say, if you are to maintain an open door in China—

Mr. BRITTEN (interposing). Let us ignore the question of policy entirely. Let us assume that we are 3,000 miles from Great Britain and we are much further from Japan than we are from England, and, therefore, a smaller fleet, according to that reasoning, would be required on the west coast than on this side. As a matter of fact, the fleet on that side could be immeasurably smaller.

Mr. VENABLE. You are assuming that the Navy would be used only for defense of the coast?

Mr. BRITTEN. Yes; because, as has been said, we are not a nation of conquest. The admiral has indicated that also, and I am just trying to see now if he would be satisfied, assuming that we have no policy of conquest and that the horizon is clear, to have our Navy in second place, or how much below the Japanese Navy he would be satisfied to have it?

Mr. VENABLE. You are assuming that the Navy would be used only as a means of coast protection?

Mr. BRITTEN. Yes.

The CHAIRMAN. If it were used only for coast protection, there would be no fighting done. Let me see if I understand this: Judge Venable's question is whether you are going to use the military forces for protection only. If you are going to use the military forces for protection only, as I understand it, we would never get away from our own coast.

Admiral SIMS. I quite agree with you, and therefore the question is not a useful one. If you get into trouble with anybody else, you must bring them to terms. For instance, suppose we got into trouble with Japan because she was doing something to our people that we would not stand, or because she wanted to take the Philippines, or was interfering with our commerce. What would you do about it? She would carry out her plans unless you brought her to terms.

The CHAIRMAN. That is the reason why I asked the question I did.

Mr. BRITTEN. After all, it resolves itself into this—that if we are to maintain our independence upon the seas, if we are going to protect our commerce upon the seas, we have got to have a Navy that will protect us in that undertaking.

Admiral SIMS. If that is the policy, yes.

Mr. BRITTEN. I guess there is no question about that. We must protect our commerce with the world, and in order to do that, would it not be wise to have a Navy equal to any other?

Admiral SIMS. It is entirely up to you to decide those policies.

Mr. OLIVER. Admiral, I have been led to believe from what you and other naval officers said that there is no such thing as a defensive navy, but a navy to have strength must have offensive power.

Admiral SIMS. Yes, sir.

Mr. OLIVER. In other words, if we should have war, it would be in the interest of this Government to shorten the war, and you could not shorten the war if your navy were built for purely defensive purposes?

Admiral SIMS. I do not think you understood what I meant. I did not mean that the Navy should be built purely for defensive purposes; but if it is your policy, and I do not say that it is, that you will never go across the ocean with aggressive designs, then you would want to have a Navy strong enough to oppose any navy that could come 3,000 miles to attack you.

Mr. OLIVER. Is it your idea that if we should have war with a nation three, four, or five thousand miles distant from us, we should wait until they come over and strike us?

Admiral SIMS. You could not strike them until they came.

Admiral OLIVER. Your idea would be to wait until they came and struck us, and then to strike them back?

Admiral SIMS. That is not my idea at all.

Mr. OLIVER. I have always understood it was most important, when war was declared, to mobilize your forces at once and to strike the fatal blow as soon as possible. and not wait until the enemy came over.

Admiral SIMS. You are talking about things that are hardly parallel. If you got into war with a country 3,000 miles away because they insisted upon doing something to you, and they come over here to attack you, it would be foolish for you to go 3,000 miles from your operating base to attack him at his base.

Mr. OLIVER. Have the war games that have been worked out at the War College been largely confined to the defense of our coast, with the idea of waiting until the enemy comes near our coast before our Navy asserts its power?

Admiral SIMS. We have never had any war games involving going across the Atlantic, for instance. We would have no hope of being able to operate at that distance, having no base on the other side at all. Those tests are devoted to operations against a fleet, or the defeat of a fleet, if it should come to base itself over here, or to attack, for instance, the Panama Canal, or to take a base in the Caribbean Sea.

Mr. OLIVER. Have you not had war games—purely imaginary war games—that carried you far away from American shores, sometimes as far as 3,000 or 4,000 miles, and were we not shown some war games of that kind recently?

Admiral SIMS. Yes.

Mr. OLIVER. So the power of a fleet is not alone in its defensive qualities, but it must of necessity have offensive power which will enable you to strike and strike early?

Admiral SIMS. There is no defensive power in a fleet—that is, power as a whole.

Mr. OLIVER. What did you understand President-elect Harding to mean a few days ago when he was quoted as saying that a fleet not quite good enough was worth nothing?

Admiral SIMS. That is right.

Mr. OLIVER. What did you understand he meant?

Admiral SIMS. It has got to be strong enough to carry out what you want to do.

Mr. OLIVER. He did not qualify it by saying what you wanted to do, because no one wants war, but if war comes—and sometimes it comes without our asking for it—the desire is to terminate it as soon as possible.

Admiral SIMS. A fleet that is weaker than that of your enemy is of no use.

Mr. OLIVER. Suppose we had pursued that policy before the Spanish-American War and had a fleet which had to wait until they struck at our shores; that would have been a prolonged war, would it not?

Admiral SIMS. That is what we did.

Mr. OLIVER. We went out and met them.

Admiral SIMS. No.

Mr. OLIVER. Did we not go to the Philippines?

Admiral SIMS. Yes; but we waited until they came across on this side of the Atlantic; we did not go and strike at Spain until after Cervera's fleet was destroyed.

Mr. BRITTEN. We fought in their territory, however.

Admiral SIMS. We waited until they came across to this side, and not until they were destroyed here and we knew they had no ships sufficient to oppose us did we propose to start out to the other side of the Atlantic on our way to the Philippines. I was in Europe, handling the other end of it, at that time, and Admiral Sampson's fleet—it was given out to the press that it was Watson's fleet—was coming across, and arrangements were all made for them to come through the Straits of Gibraltar, and that if they were not attacked

by torpedo destroyers, etc., as they came through, that we would not molest the Spanish coast at all, but would pass right through the Suez Canal, after Cervera's fleet had already started to the other side. But we did wait for the Spanish to come over on this side, and we defeated them over here, where they had no bases that were adequate for their purposes. They had to go into Santiago, and there was nothing there for them in the way of repairs, or much of anything else.

The CHAIRMAN. I am not the possessor of information that my colleagues do not have, but I do know that these nations are going to be invited to talk over the question of disarmament, and we have your opinion that these nations will accept the invitation when given. So that brings us into a meeting. I understood you to say that in your judgment you believed it would be possible, or at least that we might reasonably hope, that some success would be obtained in this meeting for a limitation of armament—not for a total disarmament, but for a partial disarmament. The pressure, you understand, is very great.

Admiral SIMS. We could not have total disarmament but some agreement might be reached whereby great increases would not be made, in order to diminish the financial burden of the navies.

The CHAIRMAN. This year the Committee on Appropriations has recommended to the House of Representatives a continuation of the 1916 program, which will involve of itself about \$90,000,000. The American Government can not, nor can any other Government in peace time, afford to spend \$90,000,000 or \$100,000,000 for new ships every year. However, that is aside from the question which I wish to ask you. Inasmuch as we expect to have a meeting which may result in limiting us in construction, do you advise that we should abandon, for the time being, the continued construction of the 1916 program?

Admiral SIMS. I should not think it would be practicable to do it; I should not think it ought to be done.

The CHAIRMAN. I would be glad to have your views on that.

Mr. HICKS. Do you think it practicable or advisable?

Admiral SIMS. I do not think it would be advisable to stop it; no.

Mr. HICKS. Entirely aside from the material loss we might incur if we abandoned any part of our program, as a matter of policy do you think it would be unwise to abandon it?

Admiral SIMS. I should think so.

Mr. OLIVER. We are given to understand when that program is completed, it will give us a Navy stronger than that of Great Britain, but assuming what you said at first to be correct, it would be unwise to continue it, would it not?

Admiral SIMS. I do not think so.

Mr. OLIVER. If naval officers generally agree that in tonnage and gun power we would be even stronger than Great Britain with these modern ships, you still think it would be wise to continue building?

Admiral SIMS. That depends. The feeling is that we should not be stronger in capital ships alone, but be equal to them in other respects; that is, things in which they are much ahead of us.

Mr. OLIVER. We would probably be ahead of them in destroyers as well as capital ships.

Admiral Sims. But I did not mean that. I meant submarines and airplane carriers.

Mr. OLIVER. If our submarine is as good as their submarine, we will be equal, because we will have as many as they have by January 1, 1923.

Admiral Sims. But I think it is the general understanding that the submarines we now have are not equal, type for type and date for date, to their submarines, and that is particularly true as to the submarines used during the war by Germany. Every submarine officer I have spoken to has told me that our boats are distinctly inferior to the ones on the other side. That is not because our people are not as clever as those people are, but it is because those boats were built under the pressure of warfare, and everything that was recommended by the experts was put into them. I have been told that our officers found in those boats all of the things they had recommended be put in our boats but which had not been put in them. In times of peace, when there is no particular pressure, all sorts of things happen. The men who design the boats have a certain amount of pride in them and they do not like to have it suggested that the design was not of the best. They do not like to have it suggested that this or that thing should have been put in the boat and as a rule they do not accept suggestions and put in the things which officers in service believe to be necessary. I do not think there is any doubt at all that the boats on the other side are distinctly superior to the ones we have built here, but I do not think that will be so in the future, because we have had the benefit of that experience. We have overhauled those boats.

Mr. HICKS. In the air they would be superior?

Admiral Sims. In the air they are superior, as I understand it, to an extraordinary degree.

Mr. HICKS. Due to what, the carriers, their machines, or what?

Admiral Sims. It is due to both. They have some carriers which they have specially built; they have had experience with them and they have had experience with the machines in connection with the carriers for landing them on board. Moreover, they have machines on the other side which are almost ludicrously superior to the ones we have over here. It was reported in the press a little while ago that a plane which was brought over from Germany—I think built by the Fokker Co. after the armistice was signed and therefore was their property and not that of the Government—flew from Long Island to Washington with 1,000 pounds of mail at 110 miles an hour and at the expense of 7 gallons of gasoline. It was a monoplane with a 160-horsepower engine. In competition with that, or at about the same time, we had one of our planes that had two engines, each engine having 400 horsepower, so that it had 800 horsepower in all, fly at about the same speed. It carried 800 pounds of mail and it used 56 gallons of gasoline to make the trip, which would indicate that they had designed them better over there. But I think that is probably due more to their experiments than to anything else.

They have no doubt built wind tunnels in which they have tested various models in order to determine the type which would give the least resistance, etc. Anyway, there is no question about their superiority, and that means a great deal. If the question comes up here as to the relative values of battleships, airplanes, carriers, etc., I can go into that a little bit more fully.

UNITED AIR SERVICE.

Mr. HICKS. What has been your feeling in regard to the efficiency of the British Air Service as directly attributable, we will say, to their having a united air service?

Admiral SImS. My experience in connection with the whole business over there was that the United Air Service was something which was forced upon them and against their will, due to the exigencies of the war. In order to combat the German air forces on the Western front they had to combine their air forces. As for the efficiency of a combined service, I think it has demonstrated its decided inefficiency. As I say, when we come to discuss this air question, if it is your intention to do so, I can explain why it is that a naval force, if it is going to have an air service as one of its principal auxiliaries, should have the pilots trained in the navy, day in and day out, in connection with the fleet under the commander in chief. I am even willing to say that if you find out by your discussions that an adequate air service is absolutely necessary with the fleet, that that air service would be almost entirely inefficient if it were made up of pilots that were trained by somebody else besides the Navy.

I must go into some detail to explain what I mean. If we had to operate our fleet off our coast, a fleet of, perhaps, 200 vessels, almost none of them would be in sight of the commander in chief, except his own battleships. The purpose of the War College is to learn how to train that fleet so that the commander in chief, after contact is made with the enemy and it is reported to him what the location is, has no detailed orders to give. We play such games out at the War College day after day. The commander in chief of a fleet of that kind on the game board will give an order, say: "I intend to attack immediately from the westward." That is all. We play game after game, and we develop a doctrine as to what the destroyers should do and as to what the submarines should do if they are in position, and we have got to have a similar doctrine as to what the airplanes should do. You can not give a detailed order to each subdivision of the force. We work it out on the board; and it is being worked out on the game board in Newport now. Our navy air-men have got to be seamen, and for this reason: A man flying with a squadron of airplanes to make an attack upon a fleet who must necessarily depend upon his initiative as to how that attack will be made, must have been trained with that fleet in order to know what it is likely to do; he must know what the destroyers are going to do.

In all these games our purpose is to develop a doctrine which must be followed, and that is the reason we must have in a naval air service Navy-trained pilots, who live with us and train with us. The ships that carry those planes and go with the fleet have got to be naval ships, and the men who do the landing of their planes on those ships and make recommendations as to what kind of machines they must be, have got to be nautical men. Moreover, I will say this, that if our coast should ever be attacked, one of the strongest defenses against an enemy fleet will be an air force. If there are air stations up and down our coast, the commander in chief should be able to call those air stations and have the air force concentrated to fight the enemy fleet. If an enemy fleet, we will say, approached between

New York and the Delaware, there should be a flying field in the middle so that the commander in chief could, in a few hours, concentrate all of the coastal flying force at that place. And in his maneuvers, summer after summer, he should have been doing that very thing, and those air people should have been operating with the fleet and they should be naval men right straight through. The same is true of the Army Air Service. Airplanes used in Army maneuvers must be accustomed to those maneuvers; they must know what the Army is going to do, as you will see from the testimony that has been given before Congress by Gen. Mitchell. You can not have an efficient Navy, if the Navy's efficiency depends to a considerable degree on an air force, unless the air force is naval. It is quite impossible. You might just as well say you will have 300 destroyers that are manned by somebody else, somebody that never left the land at all or operated with the fleet at all—that is, not naval men.

SHIPS BUILDING IN ENGLAND.

The CHAIRMAN. I would like to take you back a minute. This is very interesting and we will have more of it. I can never get out of my mind the rule of comparison that has prevailed in this committee ever since I have been a member of it, which is a quarter of a century, and I am wondering what is to be done with those three enormous battle cruisers built in English yards. We have been told they are not for England, and the Japanese state they are not included in their budget. Can you raise the veil of mystery and tell us something about those three ships?

Admiral SIMS. No; I do not know at all. I have seen the report that they were being built for Japan, and I have seen that report denied. I really do not know what they are being built for.

The CHAIRMAN. Of course, they are not being built for a philanthropic purpose.

Admiral SIMS. Do we know what they are like?

The CHAIRMAN. Well, there is a certain mystery surrounding these boats. Nevertheless, we have official information that there are three of them in number and, perhaps, equal in size to any battle cruisers ever built. They are said to be enormous capital ships, but we have been unable to learn where those ships are to go and it may be none of our business. Still it would be rather interesting, inasmuch as we have been in the business of building ships over here ourselves, to know something about them if you can tell us.

Admiral SIMS. No; I do not know anything except what I have seen in the press about them.

The CHAIRMAN. You are a member of the General Board?

Admiral SIMS. Yes.

NAVAL POLICY; NAVAL BUILDING PROGRAM.

The CHAIRMAN. In view of your opinion bearing upon the principle of limiting armament, and that it might be successful, you would not think it wise for us to authorize at this time the construction of these additional ships which the General Board has recommended, would you?

Admiral SIMS. What vessels do you mean?

Mr. BRITTEN. Those ships for rounding out the Navy, the airplane carriers, cruisers, etc.

The CHAIRMAN. It is admitted by all naval men that those ships are necessary to round out the fleet, if we are going to round it out, is it not?

Admiral SIMS. The expression "rounding out the fleet" is entirely indefinite; it means nothing at all unless it is defined. But I do not hesitate to say this: That so great is the menace of airplane attack that our fleet as it stands to-day, and what it will be when the ships now under construction are completed, would be of little use in a contest with another fleet adequately supplied with an air force and with improved submarines, and our fleet would easily be defeated. In order to make our fleet of any real use we have got to develop that air force because it is being developed on the other side with great rapidity. I do not know just which question you are on now, whether or not on the question you are as to the possibility of the battleships some of these days being knocked out by an air force—

The CHAIRMAN. Before you go into that, and so it may appear in the record, please tell us how much superior in tonnage and great ships England is, so that the country may judge whether or not England is not building ships at this time because of that superiority.

Admiral SIMS. Well, I do not know what the figures are now; I have seen them but I do not recollect them. The General Board people can probably give them to you, as they handle those figures every day.

The CHAIRMAN. Do the members of the committee desire to inquire of Admiral Sims as to the development of the Air Service?

AIRPLANE CARRIERS.

Mr. BRITTEN. Before that question is taken up I would like to ask the admiral a question or two. We are now constructing six battle cruisers. One of them, the *Ranger*, is less than 1 per cent completed. Would you advise that that construction be changed from a battle cruiser to an airplane carrier?

Admiral SIMS. Do you mean in the case of only one of them?

Mr. BRITTEN. Yes; in order to get one carrier just as quickly as possible.

Admiral SIMS. Would you get it any quicker than by building one?

Mr. BRITTEN. Well, I was thinking of getting a bill through the House at this time—which is highly improbable—or an amendment to the existing appropriation bill, providing for changing the construction of one of these cruisers only 1 per cent completed and making it an airplane carrier. Do you think an airplane carrier is of greater importance to the Navy than a cruiser?

Admiral SIMS. That brings up a rather peculiar question, and that is this: It is a general principle in warfare that if your enemy builds a ship that can do something to you that you can not do to him, that you must accept the disadvantage or build something of the same character. Just to give you an example. The first battle cruisers that were built were built secretly. Nobody knew that Great Britain was building the first three battle cruisers; they kept the thing concealed. They listed them as armored cruisers, but they

had to build twenty-four 12-inch guns to put on them and they knew the naval attachés would find out that the guns were being built. So they induced the Sultan of Turkey to sign a contract, in due form, for these guns, in order to conceal the real purpose. The German naval attaché in London paid \$70,000 in bribes to various officials to get a look at the contract, only to find out that they were being built for Turkey. The consequence was that not until the ships were launched did they find out that they represented a new type, and that held Germany up, as Lord Fisher states in his memoirs, for three years, because she could not possibly dare to go to war with Great Britain without three vessels of that kind, vessels having 12-inch guns and a speed of 30 knots.

Now, as to your question whether we should build our battle cruisers, and my answer is that that depends on whether the other fellow has them. We, for some reason which I have never understood, have resisted the building of battle cruisers, but if we should go to war, for example, with Japan, which has had four battle cruisers for a long while, and she is building others, we would be at a great disadvantage, and, quite independent of the question of an air service, submarines, battleships, or anything else, those vessels will do you damage unless you counteract them. So I should say it would not be well to stop the building of any of those battle cruisers. In connection with that, a question came up some time ago as to whether or not we should, as soon as possible, get a ship or some ships on which we could practice and learn how to handle an airplane carrier. They are now changing the *Jupiter* and she will be called the *Langley*. She can make a speed of 14 knots. The efficiency of a carrier, and the efficiency of the planes she uses, depends upon her speed. No matter whether she were 800 feet long, a high-speed plane could not come down and land on her deck; it would run over her bow. But if you put her head to a wind that is blowing 20 miles an hour, it is the same as though she were going 34 miles an hour, and if she is going 30 knots instead of 14 knots that will be equivalent to 50 miles an hour, and your plane would be approaching the landing deck at a relatively slow speed—that is, the speed of the plane less 50 knots. We want some vessel, or a hull, on which we can practice taking on and taking off at a 30-knot speed.

We do not want to go ahead and develop planes which can only land safely on a 14-knot ship, because they would not be anything like as efficient as the other type, those that can land on a 30-knot ship. The proposition came up in the Navy Department as to whether it would not be well to convert two of the ten 7,500-ton cruisers we are now building into airplane carriers in accordance with plans already drawn up. They would not carry so many planes as a regular carrier, and it would cut their speed from 35 knots to 33 knots, or something like that, but they would be just as good carriers as the long ones with that limitation. That proposition was referred, I think, to the General Board. I do not remember the course it took, but it came up to the War College, and the War College was able to demonstrate—we had conferences over it—to our satisfaction that if you did not use those airplane carriers for anything else but scouting that you would have the ability to send the planes out 200 miles on each side of the scouting line, and that you could therefore scout over more than twice the distance. Moreover, you

would have torpedo and bombing planes which would enable you to resist the battle cruisers that came along, and we very strongly recommended that these vessels be converted to carriers, because in that way we could go right ahead with the development of our fliers, and also planes which could land on the decks of 30-knot ships.

Mr. PADGETT. What is the contemplated speed of the scout cruisers?

Admiral SIMS. Thirty-five knots.

Mr. PADGETT. Are they up to 35 knots as well as the battle cruisers?

Admiral SIMS. Yes; but converting them to carriers will bring the speed down to 32 or 32½.

Mr. BRITTEN. You have reference to the 10,000-ton cruiser?

Admiral SIMS. I think they are 7,500 tons.

Admiral MAYO. Seven thousand one hundred tons.

Mr. BRITTEN. The latest recommendation I have from the General Board is for five cruisers of about 10,000 tons displacement.

Admiral SIMS. What are those?

Mr. PADGETT. They have never been authorized.

Mr. BRITTEN. This is the latest recommendation of the board.

Mr. PADGETT. You are speaking of the ships authorized in the 1916 program?

Mr. BRITTEN. Yes.

Mr. HICKS. You are stressing, and I think very properly so, the importance of aviation in its relationship to naval maneuvers.

Admiral SIMS. That is not the word; it is not the importance of it but it is absolutely essential, because you are going to get licked if you do not have that.

Mr. HICKS. I presume that in dealing with the various arms of the service—submarines, destroyers, etc.—there is a relative value that you give those arms in their relationship to the battleship?

Admiral SIMS. Yes, sir.

THE BATTLESHIP VERSUS THE AIRPLANE AND AIRPLANE CARRIERS.

Mr. HICKS. What relationship would you give or what assessed value would you give to aviation in comparison with a battleship?

Admiral SIMS. That brings up the question of battleships, airplanes, etc., does it not? We are launched on that now—is that the idea?

Mr. HICKS. Yes.

Admiral SIMS. That depends upon some information which we do not have, and all you have now is opinion, and my opinion is not any better than anybody else's opinion. But I can say this: If we assume that an airplane can do anything like what it is claimed it can do, or can do what it is claimed it will be able to do in the immediate future, you can say this: Here is what is claimed, that an airplane can drop a torpedo in the water—

Mr. HICKS. That is what I would like to hear about.

The CHAIRMAN. It is not mere bombing that I am thinking about.

Admiral SIMS. I understand that perfectly well. Here is what is claimed: It is claimed that airplanes can launch torpedoes in the water successfully. They have difficulties now because the torpedo

was not intended to be dropped that way, and it has weaknesses in certain parts. It is believed, however, and I believe that the torpedo can be so designed that it can be dropped safely from a considerable height, whether by parachute or other means. It is claimed, and I believe it, that a 10,000-yard torpedo can be so launched that it will run with fair success. From the results of experiments in bombing the decks of the *Indiana* and a space of probably 50 feet around her, 40 per cent of hits were scored from a distance of 6,000 feet in the air. Of course, it would be a less percentage if you went higher than that.

Now, if we assume, as I assume, that we have no adequate means at all of successfully opposing the attack of airplanes by guns, and if you assume that what these people claim can be done, it means this, that if you have a battleship at sea and an airplane carrier at sea, and both of them are alone, the result is entirely inevitable that the airplane carrier, having a speed of 35 knots, does not go anywhere near the battleship. She can send her torpedo airplanes out and they will fire torpedoes at the battleship, and the chances are that she will be destroyed. Moreover, with airplane carriers and a squadron of battleships at sea, they would have a better chance of hitting the latter with bombs, because they would have a longer line of target at which to shoot. They would admit of much easier bombing, because they would present a long line. Therefore, assuming that they can hit with the bombs, and planes can now carry five 1,000-pound bombs, then a battleship can be destroyed by them. They can destroy battleships or so cripple them as a squadron that they would not be able to do much damage. The whole question, as I understand it, is this: Is the airplane carrier of the immediate future a capital ship; and, if so, is she a capital ship that is stronger than the battleship?

Now, I have watched the discussion that has been going on in the London Times, and which has been reviewed in this country very ably, and much better than I am able to do here. Still, we have brought this matter up for discussion in the War College, and the discussion takes this form: It brings out the familiar fact that the average man suffers very severely from the pain of a new idea. Almost all of the questions were fundamentally new, and the first position usually taken on such things are likely to be wrong. As a little digression, take the question of the submarine. Nobody in the Navy, or rather no Admiralty or any such body, understood the submarine and its qualifications in 1914. I wanted to make that statement in some article that I was writing, and I looked up the records of the reports of boards and of the principal European officers and of some American officers, and I did not find anything enthusiastically in favor of submarines. On the contrary, I found almost universal condemnation of the submarine. According to those reports it was a thing that could perform "circus stunts in fair weather"; that it would destroy the health of the crew inside of a week; and that it had to operate with a mother ship alongside her. When the *Audacious* was torpedoed off the northwest coast of Ireland, the British Admiralty made a minute investigation of the western coast of Ireland and of Scotland to see where the submarine's base was. They did not for a moment suspect that the submarine tha

laid the mines that sunk the *Audacious* could have been based at Wilhelmshaven.

Much less did they imagine that they could operate at a distance of 300 miles off the western coast of Ireland and the larger ones even remain three months in the neighborhood of the Azores. There was a complete misunderstanding of its capabilities. Germany misunderstood the submarine in the same way, but to a less extent. That remarkable man, Von Tirpitz, insisted on building 800-ton submarines so they could go to sea. He said that they could go to sea, and he sent a dozen of them into the North Sea, where they stayed for two weeks and came back in good condition. They knew that they could do that at a time when we did not know it. There was an entire misunderstanding of the capabilities of the submarine.

In reference to this question of the importance of attack on ships from the air, I therefore drew up a paper, which I have not here now, but which was designed to start a discussion. I started out by proving that the battleship was the backbone of the fleet, and then I proved the opposite upon the assumption that I have been giving you here to-day. I said that the War College has got to have a reasoned opinion about this pretty soon. In deciding what the capabilities of this instrument are, I said that we should take the inventor's rule and see what would be the result.

In order to make the comparison, I proposed to do it by a game of war something like this: We will assume that some nation is building in competition with us and builds airplanes and airplane carriers; we will assume that the airplane carrier is a capital ship and that she builds, we will say, 20 airplane carriers, while we build 16 battleships and 4 airplane carriers. Now, each of those fleets will be provided with the auxiliary ships, each one having 6 battle cruisers, 100 destroyers, 30 light cruisers, and 30 submarines. In other words, we will assume that the fleets are identical in all respects except that one has put his money into airplane carriers, 20 of them, while the other has 16 battleships and 4 airplane carriers. Now, each of these airplane carriers carries 30 planes—10 torpedo planes and 20 bombing and fighting planes—or, in other words, 20 carriers would carry 600 airplanes, while the other fleet would carry in its 4 airplane carriers 120 airplanes. Now, if we are to assume that the claims of the inventors of these machines are anyways near true, it simply means that the fighting plane would readily wipe out the 120 planes that the other fleet has got, because they would have 5 to 1.

In other words, the fleet that has the great number of planes will command the air, and they will be in a position to carry out their operations against the other fleet by torpedo attack and by bombing planes at their pleasure. If the claims of the airplane people are true, it simply means that an "airplane fleet" of that kind described would inevitably defeat the other. There can be no question about that. Now, what we need, and in order not to be caught napping, and in order not to go on waiting until somebody develops something for us to follow, is to find out about this. To do that, we have got to put some money, time, and some steam behind the development of the airplanes themselves—that is to say, behind the development of the torpedo carrying airplanes, the torpedoes that they will carry, and the airplane carrier for the planes to fly off from. I do not think there is any question at all in reference to the efficiency of

our fleet that is of anything like the importance of pushing ahead with this development of airplanes and airplane carriers.

Mr. OLIVER. May I ask you a question right there?

Admiral SIMS. I would prefer to go on for a moment without interruption. Now, suppose we take the opposite side: I have had a number of papers presented to me saying that we can not drop torpedoes from such a height, because the gyroscope will be knocked out and because it will knock off the tail of the torpedo. They admit that the plane will come down all right, but they claim that the shock of the torpedo on the water will derange the gyroscope and knock off the tail. Just as soon as you assume that, you of course "prove" that the airplane is no good, and that the battleship is therefore the backbone of the fleet. I am not now expressing an opinion as to which assumption is correct, but what I say is that we need to find out. I do not believe that American mechanical genius is incapable of developing a torpedo that can be dropped, 30, 40, or 50 feet without breaking it, or that it can not make the torpedo so as to prevent the gyroscope from being knocked out. I also believe that you can drop a torpedo with a parachute if you want to, or in various other ways. I believe that that can be done with the biggest torpedoes that we have. I also believe that a bigger torpedo than we have could be dropped in the same way, also that we can drop bombs on battleships. I do not think there is any question about it at all. Of course, the closer you come down the more subject you are to gun fire, but we know from the experience on the Western front in Europe that not more than one-tenth of 1 per cent of hits were made by gun fire directed at airplanes. In other words, they fired 1,000 shots in order to make one hit against airplanes.

While it is true that you can hit a ship on the surface of the water or an airplane while running on the surface of the water, because the water is your guide, the conditions are fundamentally different in the air. Where the target is on the water, you shoot at it and see the splash that your shot makes on the water, but when the target is in the air, you can not measure how far away it is. Your shot is fired, but you do not know where the shot goes, because you can not see it, there being no splash, as would be the case on water. As I have said, in the gunfire directed against the airplanes on the western front, they made only one hit out of 1,000 shots. Our bombing experiments carried out against the *Indiana* showed 40 per cent of hits on the deck, or close enough alongside to do her damage, and those bombs were dropped from a height of 6,000 feet. Of course, if you went higher, you would make a smaller percentage of hits.

Mr. PADGETT. How much damage did they do?

Admiral SIMS. They were dummies used to see whether they could hit her or not. The pictures you saw in the papers represented what the bombs did when they were laid on the deck and set off.

Mr. AYERS. Was the *Indiana* stationary or running?

Admiral SIMS. She was stationary.

Mr. BRITTEN. Were the bombs that were laid on the deck the same size as the dummies?

Admiral SIMS. No, sir; they were very much larger than those that were dropped.

Mr. BRITTEN. Were the bombs that were placed on the deck of the same size as those that they would use for bombing purposes?

Admiral SIMS. Yes. As for the ship being stationary, it is no more difficult to hit the ship when it is moving than when it is stationary, if you can make any estimate of her speed.

Mr. PADGETT. In other words, it is no easier to shoot a partridge sitting on a limb than when flying?

Admiral SIMS. No, sir; you know the direction in which the vessel is going and its speed. If you have a column of ships for your target, it would not be any more difficult to hit a ship when moving than if it were still, if you can make any estimate of her speed.

The CHAIRMAN. Admiral, we are building ships to stand the shock of 16-inch shells.

Admiral SIMS. Yes; on the outside armor.

The CHAIRMAN. We expect them to resist projectiles fired from 16-inch guns. In other words, we are providing protection for the ship against a 16-inch shell, and that shell, perhaps, may be fired from within 2 miles. Now, you do not mean to tell me that they can drop a bomb out of the air, a bomb with no propulsive force behind it, but which simply comes down of its own weight, that will be as effective as a projectile fired from a 16-inch gun?

Admiral SIMS. I have seen bombs that weighed 3,000 pounds. They were about 9 or 10 feet long, and 18 inches in diameter. They are pointed in shape, and when they drop, they come point downward. They dropped such bombs on the western front that knocked out buildings for nearly two blocks around. They will throw down buildings for an entire block around. They carry a tremendous high explosive. They have a delayed-action fuze that does not go off until sometime after they strike. Those bombs penetrate the surface where they strike, and I do not think any ship has been so built as to prevent such a bomb going all the way down to the protective deck.

The CHAIRMAN. Do you mean that it would penetrate the protective deck and go off?

Admiral SIMS. The protective deck is not on top, but it is underneath. It is just above the water line.

The CHAIRMAN. Would you expect such a projectile or bomb dropped from a plane to go down through the protective deck?

Admiral SIMS. It would go down to the protective deck and explode, and the explosion would break through.

The CHAIRMAN. They could build it higher up, could they not?

Admiral SIMS. No, sir.

Mr. BRITTEN. Do you know of a single instance during the recent war where a bomb dropped from an airplane landed on board a ship?

Admiral SIMS. On that particular point, I would like to say that there was no evidence at all during the war, nor is there anything that has happened during the war, which shows us what they can do in that respect, because they never made any attempt to drop bombs on each other.

Mr. BRITTEN. Did they not have bombing planes?

Admiral SIMS. Yes; but they could not reach that far. The British were always apprehensive that planes would be built that would be able to go to Scapa Flow and bomb the ships up there, but they were not able to do it at all.

Mr. BRITTEN. Did the British ever attempt to bomb the submarine bases at Zebrugge and Ostend?

Admiral SIMS. They attacked them continuously.

Mr. BRITTEN. With planes?

Admiral SIMS. Yes.

Mr. BRITTEN. And still you have no record whatever of having hit a ship?

Admiral SIMS. All of those ships were under cover. There were great steel and concrete culverts or arches, and the submarines went underneath them.

Mr. BRITTEN. They could not break through the culverts and reach the submarines?

Admiral SIMS. No.

Mr. HICKS. Admiral, let us assume that the British fleet should have a naval engagement to-morrow, and I have taken the British fleet for the illustration because they seem to be further advanced in aviation matters than we are: Assume that the British fleet should have a naval engagement to-morrow, with its present equipment in aviation and in every other field of naval activity, what percentage of importance or value would you give to aviation as against battleships?

Admiral SIMS. Well, as I have said before, an opinion is no good at all until you have the evidence. If the assumptions that are made by the people who are designing these airplanes now are correct, and if they are successful, and I like to believe that Americans will be successful in such a matter as that, then the airplane is extremely important.

Mr. HICKS. I was taking the British fleet as an illustration, because they seemed to be further advanced in aviation matters.

Admiral SIMS. Well, if some other fleet should have as much as, say, three times the number of airplane carriers that the British fleet has, then, of course, the first effort task of this fleet would be to wipe all the British airplanes out of the air. That would be the first thing necessarily. Now, if we assume that the opposing fleet loses as many planes as the other one does, then this fleet would have two-thirds of her planes left with which to bomb and torpedo the other fleet. If the assumptions that have been made are true, I think they would destroy that fleet. I regard it as a fundamental weapon.

To illustrate what I mean, you have heard the following kind of argument made every time a new weapon has been brought out. When the small torpedo boat and the torpedo was comparatively well perfected they said that the battleship was done for, but we countered this new weapon with the destroyer. However, note this, that the destroyer operates on the water and so does the torpedo boat, and therefore, in order to counteract the torpedo boat, we built a vessel that was faster and that had greater offensive power. But here a very fundamental difference comes in: Suppose the torpedo boat, instead of having to float on the water, could fly in the air, and could fly faster than the destroyer could steam, and could take whatever position she wished with reference to the destroyer. The result would be that the little vessel could destroy the larger one. The same is true of airplanes. The small ones can destroy (bring

down) the large ones. The small planes are the fighting planes because of their speed and climbing power. Of course, you can build big airplanes, but what does that mean? In the first place, the bigger it is the more unhandy it is in the air. An airplane carrying 6,000 pounds of bombs would have tremendous wings, and it would be like a majestic bird. Such an airplane could not have the speed that a little fighting plane has, and in combat the smaller one would climb up in the air over it, at a speed of 130 miles an hour. The big bombing plane can not meet the attacks of the little fighting planes, and therefore the airplane carrier carries 10 torpedo planes and 20 fighting planes and bombing planes. Now, if you have a greater air force than the other navy has, you can wipe all his planes out of the air, including his bombing planes, and then you would be free to do your bombing and torpedo firing afterwards.

Mr. PADGETT. I would like to ask a question: Assuming, as I do, the value and importance and military efficiency of the airplane service, and having in mind all that you know about all of the services, would you say that the battleship has become antiquated and should be abandoned?

Admiral SIMS. That is a rather curious question to ask, because I started this discussion by saying that I do not know what the airplane can do; but I can say this, and I will put it in the form of a bet: If I had the business of deciding this question, I feel confidence enough in the inventive ability and the mechanical ability of the American people to believe we can make these planes do what they say they can do, and I would prefer right now to put money into airplane carriers and the development of airplanes.

Mr. PADGETT. And abandon battleships?

Admiral SIMS. I would not abandon battleships altogether; but after you have solved this question, and you find out that these planes can do what they say they will do, then we can knock a battleship fleet out with a fleet having a superior air force. Then the airplane carrier becomes a capital ship more powerful than the battleship.

Mr. PADGETT. Then you would rely upon the airplane and airplane carriers, or your ships to carry airplanes, and rest your offensive upon airplanes?

Admiral SIMS. If this development shows that its offensive is more powerful than that of the battleship. The airplane carrier, being a faster ship, and necessarily much faster, than the battleship, will not go near the latter, but she can send her planes out from a distance of 100 miles or more from the battleship and attack from the air, having control of the air by reason of their greater number. The carriers would also have all of the usual fleet units to protect them. As I have said, the carriers would be immune from gun fire by simply using their speed to keep out of range.

Mr. PADGETT. Is it your idea that it would be a wise policy and a safe policy to rely upon airplane carriers, equipped with airplanes, instead of battleships and airplane carriers together?

Admiral SIMS. Absolutely, if those planes can do what they claim.

Mr. PADGETT. I am asking you what you think about it. If you had to define the policy, leaving out that "if" and acting upon all that you know about it—

Admiral Sims (interposing). It simply amounts to this, that some people are optimistic and some people are conservative. I will not say that they are pessimistic, but they are conservative.

Mr. BRITTEN. Does not your entire argument hinge mainly upon that word "if"?

Admiral Sims. Necessarily until you get the information; but if you ask for my belief, I will say that I believe these planes should be built, and that you should build all that you can.

Mr. BRITTEN. If you are so firm in your belief in that regard, why would it not be well to abandon the construction of one of the battle cruisers? We are building six, and one of them is just barely started. You might show by your answer to that question whether you regard the cruiser as more important than the plane-carrier.

Admiral Sims. You remember that I said a little while ago that as long as the other fellow has a class of ships that can do things to you that you can not do to him, you will be at a disadvantage. The battle cruiser, with a speed of 30 knots, could chase the lighter cruisers and destroyers, particularly in a rough sea. It is a question of whether it would be advisable to delay building them. I would rather give up a battleship and keep the cruiser, so as to balance our battle cruisers against the battle cruisers of the opposing fleet.

Mr. HICKS. I was trying to get from you an opinion regarding the British strength on the sea. If a battle should take place to-morrow involving the English fleet, would you give to aviation in such a contest a value equal to that of battleships?

Admiral Sims. I believe that it would be of more than equal value. That is my belief, but I may be mistaken.

Mr. BRITTEN. You say that you would give aviation equal value with battleships. Just what do you mean by that?

Admiral Sims. I stated a case a little while ago that I thought would make that entirely clear. I used as an illustration two fleets, one with 20 airplane carriers and the other one with 16 battleships and four airplane carriers. Now, what I claim is this, that if each of these also have an equal number of auxiliaries—that is, if they are equal in cruisers, destroyers, submarines, etc., that is, if they are exactly equal in numbers all the way through, except that one has 20 airplane carriers while the other has 16 battleships and 4 airplane carriers, it is my belief that the future will show that the fleet that has the 20 airplane carriers instead of 16 battleships and 4 airplane carriers will inevitably knock the other fleet out.

Mr. BRITTEN. But you do not there give it in terms of relative values. In making your comparison, you give the advantage to the one having great preponderance in the air. Now, when you say that aviation has equal strength or equal value as compared with battleships, you have got to qualify that by saying that you must have enough aviation to destroy the enemy air fleet.

Mr. HICKS. What I had in mind in my question was the element of aviation as against the other element, or the element of aviation against the element of battleship, and I understand that in your opinion aviation is relatively about as much as battleships, if not more.

Admiral Sims. I think it will be relatively more, assuming, of course, that the airplanes have the same auxiliaries that the battleships have.

Mr. VENABLE. Admiral, as I understand the discussion and the facts and the arguments that have been presented by you, your position is this, that it is not only important, but absolutely vital, that the possibilities of aviation as applied to naval warfare, should be determined at the earliest possible date; that there is a possibility, and indeed, a probability, that the development of aviation may revolutionize the type of the fleet and the type of fighting units, with particular reference to our larger and more costly ships, and that, therefore, it is not only important, but absolutely vital, that experiments should be carried on to determine the possibilities of aviation, and that that should be done now. Taking that as a predicate, I want to ask you whether or not it is your opinion that it would be a wise course, if we are to have economies anywhere in naval construction, in view of the financial condition of the United States and of the world, to cut our expenditures on the large ship construction, and pursue a liberal policy of appropriation with reference to aviation?

Admiral SIMS. Absolutely.

Mr. VENABLE. I think that is what we are interested in.

Admiral SIMS. That is my opinion, but of course I may be wrong.

Mr. VENABLE. It is your best judgment.

Admiral SIMS. Yes, sir.

Mr. OLIVER. Is it not very important, if that course should be pursued, that those experimental tests be made under friendly influences, and that aviation can only be developed when the people in charge have real hopes and expectations as to its possibilities?

Admiral SIMS. I do not quite understand what you mean by friendly influences.

Mr. OLIVER. There are unquestionably some who hold a very different opinion from you as to the possibilities of aviation.

Admiral SIMS. Yes.

Mr. OLIVER. It would be unfortunate if the expenditure of any appropriations we may make for the purpose of developing a liberal policy in reference to aviation were placed in the hands of parties who might not altogether be in sympathy with it.

Admiral SIMS. Yes; it should be placed in charge of those who make these claims and the whole force of the Navy Department should be put behind it to develop the machines that they think ought to be developed, and in the making of torpedoes which can be dropped from great distances, etc. In connection with that we need, almost more than anything else, a ship having a speed of 30 knots upon which we can land these planes, in order to develop the kind of planes we are going to use in the future. That is the reason the War College so strongly recommended that the proposition for converting two of these cruisers, that has been worked out in the Bureau of Construction, should be carried out as soon as possible, so that we would have them to practice with.

Mr. OLIVER. Of course, you could have practice even with a slower ship.

Admiral SIMS. Not if you want to develop quickly the kind of plane which you will eventually have to land on the decks of carriers of high speed.

Mr. OLIVER. It may take three years to build a great airplane-carrying ship, such as has been recommended.

Admiral SIMS. That is the reason we want these two converted scout cruisers.

Mr. OLIVER. You would not suggest that we delay appropriations until the completion of these other ships?

Admiral SIMS. No, sir; because the development of the planes themselves, torpedoes, etc., would go along parallel with them.

Mr. OLIVER. And tests could be made on some other ship, pending the completion of these larger carriers?

Admiral SIMS. You will have to ask the airplane people about that. I do not think you can design a plane that can be successfully landed on a 30-knot ship and also land her on a 14-knot ship. A plane that can be landed on a 30-knot ship going against the wind is the kind of a plane we want. We want the most useful plane we can get, and I do not think such a powerful and fast plane could be landed on a 14-knot ship. I do not think a 14-knot ship is worth anything so far as developing the planes and the plane carriers we are going to have in the future.

AERIAL TORPEDOES—TORPEDO PLANES.

The CHAIRMAN. We know that airplanes can carry great bombs, can discharge them and make successful hits sometimes, but we do not know yet that an airplane can carry a torpedo and discharge it successfully. That is what I have in my mind. Can we not continue to make those experiments prior to the construction of this airplane-carrying ship, and is it absolutely necessary to have this big ship in order to conduct these experiments?

Admiral SIMS. We can carry out experiments in launching torpedoes from planes while waiting for the ship to be built. You can not have the ship anyway inside of three years.

The CHAIRMAN. And maybe not in five years. I do not believe you can construct a \$29,000,000 ship in less than five years.

Admiral SIMS. That being so, there is all the more necessity for converting those two cruisers into carriers so that we can go ahead with the business.

The CHAIRMAN. You see what I am driving at. Can not those experiments be made while the ship is being built?

Admiral SIMS. The experiments in dropping torpedoes can be made; that would be quite independent of the other, because they can fly from the land. According to the information we have, they have achieved certain success in dropping torpedoes. We know that torpedoes can be dropped and we know they will run after a fashion. I can not remember the figures, but a squadron of ships made a test in Great Britain: Five, six, or seven ships anchored and were attacked by a certain number of planes, and as I recollect the figures three out of the seven ships were hit on the first discharge, or something like that. So, as I say, torpedoes are being dropped and they are running, and just now studies are being made as to the angle at which the torpedoes shall be dropped.

The CHAIRMAN. Experiments were made in the Mediterranean during the late war.

Admiral SIMS. They were making them toward the last of the war and they have been carrying on experiments since, but we do not know anything about what they have done since the armistice was

signed. I made an inquiry of an officer of the Naval Intelligence and he said they did not know anything about what they have done since.

The CHAIRMAN. If aviation can be developed to the point where it is claimed it can be, we will be able to dispense with our Infantry, our Cavalry, our Artillery, and our big ships.

Admiral SIMS. The people on shore say you will not be able to dispense with your heavy artillery or your Infantry. There is one thing, though, that is sure, and that is this: No fleet coming across the ocean to attack our coast can possibly carry any considerable number of planes. If such a fleet had 10 airplane carriers with him he would only have a few hundred planes, and our air force on the coast, if concentrated at the point of attack, would be able to wipe those out of the air and then bomb his fleet out or force it to retreat out of airplane range. The result of the discussions in Great Britain, going on now for nearly three months, is that these conclusions have been arrived at: That there is no possibility of a close blockade any more. The blockade on the other side was a geographical one. The blockade was carried out 400 miles from the enemy's ports, as you know, in the channel and up across the North Sea; but no close blockade can be kept at all on account of the submarines, and no vessels can seize a port and hold it or operate against a coast without an advance base.

If there was an island 100 miles out from our coast, which Great Britain could come over and seize, and it had a port in which she could put her whole fleet, she could not occupy it at all, any more than Great Britain could have occupied Heligoland if she had owned it, because they would have bombed it every night. A fleet coming to attack you must have an advance base because it cannot operate at a distance of 3,000 miles. There is no ship built to-day that can do it; I mean, they can not come out and carry on war operations and go back for coal; they must have an advance base, and even then a fleet must keep out of the range of bombing planes, because nothing is more helpless than a fleet at anchor within air-plane range.

Mr. BRITTEN. They could not reasonably expect to bring their supply ships and repair ships with them and retain them with the fleet.

Admiral SIMS. If they did such a thing they would have to keep them out of the range of the air force on shore. And that will be, similarly, our difficulty if we want to go across the sea to carry out any policy of ours to Japan or any other place. You would be up against the same thing, because you have got to have a base outside of airplane range.

Mr. STEPHENS. Has anything developed along the line of radio-controlled torpedoes?

Admiral SIMS. Yes; but that has a limited range. Mr. John Hays Hammond, jr., came up to the War College over a year ago and showed us what you might call a glorified torpedo. It was not a real torpedo, but it was a boat. It was in the nature of a torpedo, but instead of going under the water completely it had a conning tower with a flag on each end, so that you could see it. It carried one ton and a quarter of explosives, while a torpedo carries about 350 or 400 pounds of high explosives. This could be controlled from a plane in the air and had a radius of about 75 miles and had a speed,

as I remember it, of thirty odd knots. You can control it absolutely from the air. The airplane sees it and can steer it toward a ship.

Mr. STEPHENS. Is not that a new development of the Air Service; that is, that an airplane will be able to control and direct torpedoes through radio?

Admiral SIMS. Yes. What Mr. Hammond says is this, that you could start out from New York with, say, 20 of those boats, each one of them being controlled by its own plane; they can fix it so that there will be no interference in the control of any of the boats by any other plane except its own. They claim that can be done and they have had a certain amount of success.

Mr. OLIVER. From what distance in the air?

Admiral SIMS. Ten thousand feet. He came up there with designs of this and said, "Would this machine be of any use if you had it?" I invited him to come up and stay there a week and watch the game being played with his device. He wrote down what he claimed these boats would be able to do, and we applied the usual rule to them, that, for example, 1 in every 10 would fail to run. Then we carried on a game to show what they could do. We found they have this limitation, that they only have a speed of a rapid ship, and you could not torpedo a battle cruiser very well, because the battle cruiser is as fast as the air-controlled boat. The great power of the airplane is in this, that its speed is over 100 miles an hour. To give you an example: There is a battleship fleet, protected by 100 destroyers ahead of it [indicating]; the other fellow would like to get his destroyers in that position and fire a flock of torpedoes down through the column of ships. The defending destroyers are in position to oppose that. If the enemy destroyers should try to get around on the other side, the defenders, being on interior lines, have plenty of time to get around to meet them.

But when an attack is being made by airplanes or torpedo planes that are going 100 miles an hour it only takes a few minutes to go across the fleet to the opposite side; and they fly high in the air, out of the reach of any gunfire; so they swoop down on this side or on that side, and the consequence is that the fleet can not very well avoid the attack or keep it off, as it could in the case of a torpedo attack by destroyers. Now, another example: There is a battleship fleet and a bunch of destroyers ahead of it in position to attack, and a bunch of torpedoes will be coming down through the column of vessels, and in three cases out of four, when such attacks are made on the game board at the War College, the ships are able to evade the torpedoes by turning away. But what can be done if there is a bunch of airplanes that fire torpedoes on each side? They are coming on both sides, you see, and the effectiveness of the attack and the impossibility of avoiding it by maneuvering is apparent. It is a wonderful power, and its power is this: That there are no adequate means of opposing it except in the air itself. If you are attacked by airplanes and you have twice as many planes as your enemy has you can wipe his airplanes out of the air; but if he has twice as many as you have, and therefore wipes you out, he will bomb you with what he has left, as you will have nothing to oppose such an attack.

RELATIVE UTILITY OF AIRCRAFT.

The CHAIRMAN. I do not see why we do not transfer the battles of the future into the air.

Admiral SIMS. They are largely up in the air now, in two senses.

The CHAIRMAN. I am an old-fashioned sort of a man——

Admiral SIMS (interposing). I am as old as you are.

The CHAIRMAN. And I rather think it is up in the air and will stay up in the air. We have been fighting for a great many thousands of years and men on land have been very useful, but from what you say it would appear they are not useful any more.

Admiral SIMS. The difficulty is that men never left the earth before.

The CHAIRMAN. They left the earth in the last war.

Admiral SIMS. But not over the sea.

The CHAIRMAN. Why is it not possible for an airplane to be as effective over land as it is over the sea? Why can not the airplanes carry on all of the battles and enable us to dispense with our Infantry?

Admiral SIMS. The soldiers can tell you what they do with the Infantry. As I understand it, the difficulty is that the planes can not find the Infantry; they never march except at night, they scatter, and it is hard to get at them. But when you have a ship 700 feet long and 90 feet wide, with 1,200 men on it, and can hit it with a bomb, it is apt to be all up with that ship and her crew.

The CHAIRMAN. Of course, I can not get into this very deeply, because I do not know enough about it, but it would seem to me that an army always has an objective, and that you might have airplanes ready to destroy that army when it reached its objective.

Admiral SIMS. Nobody ever claimed the Navy could win the war and the Navy did not win the last Great War. Battleships can not climb hills any more than can airplane carriers. War has got to be settled on land. But the Navy can make it possible for the people on land to win, which is what the allied navies did in this war. We are discussing only the relative naval power of the country which has put its money into airplane carriers and the country which only has battleships and but few carriers. The sea battle will decide the control of the sea and thus help in winning a war. It has got to be won on land, but how the soldiers do that I do not know. However, I read the testimony that Gen. Mitchell gave the other day, and he said that no matter what airplanes you have you must have heavy artillery, high explosives, etc., because the airplanes can not get at intrenched troops, and the dugouts have to be knocked out by high-explosive shell and other things that I do not know about, because that is on the land.

The CHAIRMAN. You are only speaking of a contest between airplanes and battleships?

Admiral SIMS. That is it, sir.

The CHAIRMAN. But I would like to ask you my question again: We can certainly proceed with our experiments in connection with torpedoes, can we not?

Admiral SIMS. Yes, sir.

AIRPLANE CARRIERS.

The CHAIRMAN. Without having a carrier constructed immediately?
Admiral SIMS. Yes, sir.

The CHAIRMAN. We can proceed with all our experiments?

Admiral SIMS. Yes, sir. But there is one thing to be remembered, and that is that the airplane carrier is in existence and that it is successful. The British started by taking an old transatlantic liner in order to get some experience—the *Campania*, I think, was her name. They now have—I forget the exact number—I think five or six airplane carriers, some of them converted from cruisers, but some of them simon-pure carriers. We do not need to know anything more about how the carrier is to be built; and then it is only a question of getting experience in flying on and off of these ships. They have done it successfully and are doing it now. We can go ahead immediately with the building of an airplane-carrier, because I understand the designs have been made; and what we want to do now is to develop the bombing and torpedo planes, which will be of the best type.

Mr. AYRES. You can convert scout cruisers into carriers?

Admiral SIMS. The designs have been made for converting two of our 7,500-ton cruisers, and they can be converted, as I understand, within six or eight months, but a little more money is needed to do that. It can be done in a relatively short time. It will be years before you can get a simon-pure airplane carrier built, but in the meantime we can have those two converted ships with our fleet. They will increase the scouting power of the group of 10 cruisers, both in extent and in military power, and will also increase the fighting power of the fleet.

Mr. OLIVER. I was very much interested in your statement as to the landing of planes on the moving ships. Do I understand that you contemplate it may be easier to land a plane on a ship moving at 30 knots than it would be on one moving at 14 knots?

Admiral SIMS. If the plane comes down at a speed of 120 miles an hour and you had a plane carrier with a speed of 120 miles an hour, the airplane would simply settle down on it; I mean, there would be no shock in landing at all and no danger of overrunning the ship; but if an airplane has a speed of 120 miles an hour and the ship has a speed of 30 knots and the wind is blowing at the rate of 20 miles an hour, that makes the speed 50 miles an hour, so that the airplane would land on the deck at a speed, over the deck, of 70 miles an hour. If you restrict our training to the 14-knot Langley, which is the *Jupiter* converted, you add 16 miles an hour (30-14 knots) to the speed of the plane over the deck, whereas, on a 30-knot ship you can land the plane of a greater power and stop her before she gets to the end of the ship, but that could not be done on the Langley, because an airplane of that power would run clear off the deck.

Mr. OLIVER. I think the admiral has given us a very interesting technical discussion.

The CHAIRMAN. Yes. It will cost us nearly \$300,000,000 or \$400,000,000 to complete this fleet.

Admiral SIMS. On completing the battleships that are building?

Mr. BRITTEN. Yes; the 1916 program.

Admiral SIMS. Well, if I were king and could do as I pleased I would take at least a half dozen of those ships and build airplane carriers in place of them, and do it as quickly as possible.

The CHAIRMAN. You would abandon the continued construction of this fleet?

Admiral SIMS. I would take six of them and build airplane carriers instead.

Mr. BRITTEN. Six battleships?

Admiral SIMS. Yes, sir.

Mr. BRITTEN. Or battle cruisers?

Admiral SIMS. No; you must have the battle cruisers to counteract the other fellows' vessels of the same type. A battle cruiser has a speed of over 30 knots, while a battleship has a speed of only 20 or 22 knots. We would need the battle cruisers in order to counteract the other fellow who is building battle cruisers.

Mr. OLIVER. They would be able to go with your airplane-carrying ships very well?

Admiral SIMS. We want those vessels and destroyers for the protection of the airplane-carrying ships, the same as we want the destroyers and battle cruisers for the protection of the battleships.

The CHAIRMAN. It is estimated that this carrier will cost \$29,000,000.

Admiral SIMS. That is a saving on the battleship.

The CHAIRMAN. No; that is about the cost of a battleship.

Admiral SIMS. \$45,000,000 is the cost of a battleship, is it not?

The CHAIRMAN. No; they are high enough, without making them cost that.

Admiral SIMS. That is what the newspapers said—\$45,000,000. Is that right?

The CHAIRMAN. You can read almost anything in these days.

Mr. VENABLE. The last figures we had were about \$32,000,000.

Mr. OLIVER. You are at the head of the Naval War College, and as the head of the Naval War College you are brought in contact with a number of naval officers. I will ask whether many of the officers share your belief as to the possibilities of air development?

Admiral SIMS. Just whether many of them do or not, I do not yet know. I told them we had to get together on this question, and I wrote a paper, to start the discussion, which proved very clearly that the battleship was all right and then proved that it was not. We had a conference over the whole business, and I asked them to read the discussion in the London Times, of which we have a file, and the accounts that have been coming over since to the Christian Science Monitor. They have all read the whole discussion, and we are now busy on the rules for a tactical game, and when the rules are completed we will put two fleets, such as I described a while ago, against each other. Of course, a man who believed in airplane carriers could not maneuver both fleets; his mind would not be free to do with the enemy fleet what an independent man would do who believed in battleships. The college will, therefore, be divided into two parts. One part will be given command of the fleet having the most airplane carriers, such as the British have built, and the other part will be given command of the battleship fleet. Both will have the same number of cruisers, destroyers, light cruisers, and everything else.

The battle will be decided in accordance with rules, and when we come to decide what the rules are to be, then I can tell you whether most of those people are in favor of the battleship or whether they are not.

Mr. OLIVER. It is a matter, then, that is engaging the very serious consideration of naval officers at the War College at the present time?

Admiral SIMS. We intend to put it on the game board and play the thing out. Some officers may claim that a ship or destroyer can shoot a plane down every time it comes over, and some may claim that planes can very seldom be stopped by gun fire. The rules must necessarily be a compromise, and we have got to come to a decision as to what gun fire will do, and our only guide is to base it on what antiaircraft guns did on the western front. If the advocates of the torpedo and bombing planes claim a certain performance for them we may assume, for example, that their effect will be, say, one quarter or one half of that. We want to see what the commanders on the two sides will do in disposing of their destroyers; what they will do with their submarines, etc.; what they will do with their torpedoes and bombs; and then we may get some light on it.

Mr. OLIVER. If we build battle cruisers with the speed that has been provided for in reference to these that are now building they can go with airplane-carrying ships, can they not, and would they not prove the greatest menace to the merchant marine of any enemy nation?

Admiral SIMS. That is where the difficulty comes in. In this last war the extreme anxiety of the British Admiralty was naturally that they should not be reduced below the Germans in battle cruisers, because if Great Britain had 50 battleships those 50 battleships could not have prevented a half dozen German battle cruisers from coming out into the open and going where they pleased, because there was no ships in existence that had the speed to catch them and at the same time the gun power to hurt them. They could have gone into a neutral port and taken all the coal they wanted, caused a great deal of damage, and it would have been extremely serious. We were afraid they would break out at a certain time, so we had an organization to oppose them. Some people say the battle of Jutland was not a deliberate battle; they say the Germans did not come out with the idea of fighting a battle but possibly with the idea of trapping those battle cruisers.

In the first part of the war there were a number of raids on the east coast of England; they were of no military importance, although they knocked down a few houses and killed a few people; the idea was to excite the population and secure, if possible, a separation of the fleet, so that some vessels would be sent south to the east coast. You did not see much about it in the papers because the censor kept it out; but I can assure you that the uproar that was caused in Great Britain was very great and there was great criticism of the fleet because it was not protecting the entire coast of England. However, that was the criticism of ignorant men on the street who do not understand that you must not separate your forces. They made those attacks two or three times and escaped. On each occasion Admiral Beatty started to head them off with his battle cruisers, and on one occasion he succeeded, but a fog set in and he could not bring it to a conclusion, although on another occasion he caught the

Bluecher. However, as I say, there are people who think that the whole German maneuver at the Battle of Jutland was for the purpose of trying to trap those battle cruisers; and if the Germans had done so it would have gone very hard with the Allies, because that would have left the German battle cruisers free to go out in the sea. That is the reason I feel leery about your proposition to turn one of those battle cruisers into a plane carrier, because we want them for the protection of our own plane carriers, and want them also to oppose the other fellow's battle cruisers, or to force a hole through his scouting line.

The CHAIRMAN. But we will get them with the airplanes. The airplane people will get these cruisers no matter how fast they run, and if that is true why spend money to construct these battle cruisers?

Admiral SIMS. You can say the same thing about destroyers, that they can get the destroyers, and they can to a certain extent; but still the destroyer is a machine that operates in the night and there is no defense against him in the nighttime except your own destroyers; so you must have those auxiliaries. When you are in mineable water you must have mine sweepers, and when you are in submarine water you must have your destroyers, because the only opposition you have against the submarine is to attack him from the surface with depth charges. Those auxiliaries you must have.

Mr. BRITTEN. Do you know a single instance where a depth bomb fired from a plane, or even from a destroyer, positively got a submarine?

Admiral SIMS. There were occasions when we attacked submarines and destroyed them. In the early days we started with small bombs but now we are able to carry bombs which, if they strike the water within 80 or 90 feet of the submarine, will go down a sufficient depth, explode, and thus destroy it.

SUBMARINE CONSTRUCTION.

Mr. BRITTEN. I have before me a list of some 48 or 50 submarines in course of construction; some of them have been building two years and they are only 50 per cent completed. From your personal observation what do you think is most necessary to bring the submarines out of the mud so that they will be an active force in the sea?

Admiral SIMS. Well, of course, it is necessary to put some steam behind them. The appropriation has been made and the money is there, is it not?

Mr. BRITTEN. Yes.

Admiral SIMS. Well, I do not know.

Mr. BRITTEN. Some of them have been in the course of construction for two years and are 50 per cent completed, some 52 per cent completed, and others 63 per cent completed, and it has been more than two years since the contracts were made.

Admiral SIMS. Is not that a question of naval administration?

Mr. BRITTEN. Yes, it is; but I wanted to get your personal views. I have tried in several ways to find out what the trouble is, but I have been unable to locate it.

Admiral SIMS. I do not know myself. I would have to look at the original terms of the contracts and also ascertain what decisions

have been made as to extensions of time, etc. The whole thing wants stiffening up, apparently.

Mr. BRITTEN. The contracts specified a particular thing, and they were accompanied by a set of plans and specifications drawn by the Navy Department or drawn by the contractors and approved by the Navy Department, which is the same thing. Our submarine is not a success, and we have not many of them that are successes, and I am wondering what your observation has been in the premises and whether the matter has ever been called to the attention of the War College since you have been there, with a view of finding a remedy.

Admiral SIMS. What I know about that is this: I think the fault is largely due to the fact, as I understand, that the Congress has always been very reluctant to give money for pure experiments. Let me give an example: One day, years and years ago, I came out of the Army and Navy Club—that was before we had prohibition in this country, incidentally—and in some way or other I had taken a couple of cocktails; I met the Chief Engineer of the Navy at that time, and I said to him, "When are you going to get busy and put some turbine machinery in our battleships?" He said, "I will tell you, when Congress takes the responsibility for experiments on that particular kind of machinery." He said, "I know that I can get the speed that is required with the reciprocating engine because we know all about it."

The CHAIRMAN. Had he been drinking cocktails?

Admiral SIMS. No.

The CHAIRMAN. They both sound like cocktail stories to me, because Congress has always given money asked for to carry on experiments.

Admiral SIMS. That is what he said.

The CHAIRMAN. I am going to contradict him, because I have been here for 24 years and have voted for such appropriations.

Admiral SIMS. Mr. Edison made the statement a little while ago—I think it was just before the war—that this designing of a new type of machinery for submarines, then letting a contract to a contractor to make it, then forcing it through a trial and just squeezing it through and finding out subsequently its weak points, is a bad piece of business. He said they should have a laboratory and have been allowed to develop them for a sufficient period of time; I do not remember just how long, but the point about it is this: You want a machine that will give a certain impulse to a submarine; you want to have it as light as possible, but still you want to have it fool-proof. Now, he said that in a remarkably short space of time an engine could be designed, built, and tried out—not simply to the extent that you would try it out on a submarine under contract trials, but to the point of exhaustion.

In other words, you put it under such a strain that something would give way; then strengthen that part and try it again, and so on until it was able to stand say, twice as much as it would ever be called upon to stand. He says that is the way military machinery should be developed. I understand we have machinery in submarines that has passed a successful test, but we do not dare—submarine commanders tell me—to put full power on it; that if they did they would break the crankshaft.

The CHAIRMAN. The naval people have spent in the last four years between \$12,000,000 and \$13,000,000 experimenting upon airplanes, so I should say Congress has been rather liberal, and I have voted for those appropriations myself.

Admiral SIMS. You mean during the war?

The CHAIRMAN. Congress has always been very liberal in giving money for experimental purposes. When gentlemen ask appropriations for the purpose of making experiments, we do not always know that the results will prove valuable, but in the past Congress has always been very liberal.

Mr. OLIVER. I think this committee, at least since I have been a member of it, has been impressed with this fact, that the military value of the submarine and aviation has not been emphasized by those in control of the planning and building.

Admiral SIMS. I can not believe we will ever get the best and highest types until we leave the construction and design and the planning of submarines and aviation to officers who are entirely in sympathy with the military value of those weapons.

Mr. BRITTEN. There is no doubt about that.

Admiral SIMS. You can not get any push behind it until you do that. We have had hearings with Capt. Craven and others which have shown that to be true.

The CHAIRMAN. You have got to have your heart in the thing or you can not pull your legs over the rope, of course.

What I am endeavoring to say is that the fault is not with the American Congress, because it has always been very liberal with the Navy. This committee has always endeavored to be liberal in recommending appropriations for experimentation.

Mr. OLIVER. I do not think we ever turned down a recommendation of that kind.

Mr. BRITTEN. The best evidence is that there are 50 submarines now that are in that unsatisfactory condition.

Admiral SIMS. You mean they are not satisfactory, or they are not built?

Mr. BRITTEN. That are in course of construction and not making satisfactory progress. I am wondering if there is complete harmony in the Navy Department concerning the building of the submarine?

Admiral SIMS. I think there is.

Mr. BRITTEN. Of course, I think there is a real desire on the part of the Navy Department to properly construct submarines; I do not think there is any desire to hamper their construction; but yet there is a distinct failure in that direction and I am wondering why.

Admiral SIMS. I do not know. I have not been in contact with it at all.

Mr. BRITTEN. Some years ago Secretary Daniels thought that by putting an admiral at the head of the submarine force—I think it was Admiral Grant at that time—that they would get something out of the submarines. This admiral was in charge for a couple of years, and yet they tell me to-day the submarines in existence and those on the ways are not at all satisfactory.

Admiral SIMS. The submarines we had developed up to the time of our entry into the war were just as good as were the British submarines of the same type at the beginning of the war. The American boats the admiralty bought on this side went across the ocean, and I

have seen letters from the captains of the boats saying that they could have turned around and gone back again.

Mr. BRITTEN. We built them in four months, for England, but it took us four years for our own.

Admiral SIMS. They were as good as the British built at that time, but they were not as good as the German boats.

The CHAIRMAN. The construction was not as good?

Admiral SIMS. I asked a young man in command of one of the S-boats, who came into my office not long ago to pass the time of day. "What is this yarn I hear about our boats not being as good as the German boats? What is the matter?" "Well," he said, "the machinery is not as well designed as that of the Germans." He said, "The workmanship is not as good." He said, "There is no doubt about their being superior in workmanship and design." He based that on an examination of the German boats we brought over here after the armistice.

Mr. BRITTEN. The other day the Chicago Tribune editorially criticized the Navy Department for not having accepted the German submarine plans which were offered to our Government recently and which are now being accepted by the British Government. Have you heard anything about that?

Admiral SIMS. No; I had not heard about that.

Mr. BRITTEN. Admiral Coontz, have you heard anything about that?

Admiral COONTZ. No, sir.

Mr. KETTNER. That article also appeared in the New York Times.

Mr. BRITTEN. The editorial in the Chicago Tribune said there might be just cause for complaint of the methods of what it termed bureaucracy in the Navy Department.

Admiral SIMS. I think our people have gotten every scrap of information that they could get up to the time of the signing of the armistice, but they have not gotten much since then because they have not been permitted.

Mr. BRITTEN. What would you suggest that we do? If new legislation is required, tell us what you think ought to be done. If an investigation is required by the Navy Department, what do you think ought to be done with a view to the development of the submarine?

Admiral SIMS. You used a word that gives the clue. It ought to be investigated.

Mr. BRITTEN. How are you going to carry on the investigation?

Admiral SIMS. I do not know; that is up to you.

Mr. BRITTEN. How would you carry it on in the Navy Department? Would you have the matter submitted to the General Board?

Admiral SIMS. No; I think it ought to be done by a technical board that knows all about submarines. I think a technical board appointed to go into the matter and find out what is the trouble with our submarines would get at the whole business.

Mr. OLIVER. I think in all fairness it should be said that the contracts contemplated that these submarines must meet certain requirements, and if those requirements had been met they would have been very satisfactory, but when tests were held and they did not meet the requirements the Navy properly declined to receive these boats.

Admiral SIMS. That, I understand, was because of a defect in the crankshaft.

Mr. OLIVER. I understand bonds have been given by the builders, under which they forfeit large sums of money if the boats are not able to meet the requirements.

Admiral SIMS. Yes.

Mr. OLIVER. Perhaps sufficient study and care has not been taken in years past.

Mr. BRITTEN. If they meet the requirements of the plans and specifications and are put into full commission, the officers do not dare run them to their full capacity, as I understand it.

Admiral SIMS. That is what I am told; but that is hearsay.

Mr. BRITTEN. They have broken several shafts?

Admiral SIMS. They do not think it is quite safe to run them at full speed because of the weakness of the crankshaft.

Mr. BRITTEN. And it has been demonstrated that when they do that they break their shafts.

Admiral SIMS. That is what I understand.

The CHAIRMAN. The statement was made the other day, in answer to a question, that our submarines are as good as the submarines of any other nation.

Admiral SIMS. I have seen the statement.

The CHAIRMAN. The same sort of boat.

Mr. BRITTEN. You do not believe it, do you?

Admiral SIMS. I could not believe it on the testimony of the people actually in command of them. The information that comes to us from those people is that they are not as good as the boats of other nations, and there is every reason why the foreign boats should be superior. The very life of the Central Powers depended upon their listening to anything that competent submarine officers had to say, and they did listen to what those officers had to say. It is only human nature that if a man in charge of the design of our submarines has a young submarine commander come to him and say: "Here is something wrong in this submarine," to resist an attempt to make a change. There is naturally going to be some resistance to that sort of thing. The designers do not like it. It is perfectly natural that the designer should believe in his own work and therefore resist suggested changes. It always will be that way.

The CHAIRMAN. We may change our style of fighting, but we can not change human nature.

Admiral SIMS. You can not change human nature, and it will always be that way.

The CHAIRMAN. Admiral Sims, what you have said to us this morning has been very interesting and we are very grateful to you for your willingness to come down and give us the benefit of your experience and observation.

(Thereupon, the committee took a recess until 2 o'clock p. m.)

AFTER RECESS.

**Statement of REAR ADMIRAL CHARLES J. BADGER, Chairman
Executive Committee, General Board.**

The CHAIRMAN. Admiral Badger, we would like you to tell us something about the usefulness of the battleship as you understand it and as you see it, in view of the rapid developments that are being made in aviation. I have before me what seems to be a report of the General Board, or some remarks made in reply to questions submitted by the Secretary of the Navy, under date of February 2, 1921. It will be very interesting to have you talk to us, because we esteem your judgment very highly.

DISARMAMENT.

May I ask whether you desire to express any opinion as to the likelihood of a meeting of the representatives of the various nations with a view to making an effort to limit armament? Have you any information that will strengthen your judgment on the subject one way or the other? Have you been in touch with any foreign officials from whom you may have learned anything on the subject? I am asking you your opinion as to the likelihood of a meeting in the event it should be called.

Admiral BADGER. I have no information from any person in authority on the subject of a meeting of the representatives of the nations of the world on the question of disarmament. I should think there would be no difficulty whatever in having such a meeting and in having the representatives of the other nations respond to such a call. We have had such bodies before to consider that question—notably the Hague Convention.

The CHAIRMAN. You will recall that in 1907 Germany declined to go to The Hague conference on the subject of disarmament.

Admiral BADGER. They declined to consider that point.

The CHAIRMAN. I do not understand that it was ever considered at The Hague. But my memory may be at fault on that.

Admiral BADGER. While the proposition to reduce armaments both on land and sea by agreement has often been the subject of discussion, and its desirability has been generally accepted by all nations, such propositions have been officially made but a few times, the first at the congress of Vienna in 1816, from which nothing definite came: See Encyclopedia Britannica, subject "Vienna congress" (vol. 28, p. 53), showing the expectation, hope, and disappointment regarding disarmament and world peace after 20 years' war.

The CHAIRMAN. They intended there, however, to divide property.

Admiral BADGER. Military commissions and international conferences during the nineteenth century did much to define the laws and customs of war and to bring about international understandings having the object of prohibiting the use in war of certain methods, implements, etc., preventing useless cruelties, and preserving rights of neutrals and noncombatants.

Finally The Hague conference of 1899 was held. This was called by the initiative of the Emperor of Russia, the main question proposed

for discussion being that of the possibility of an international understanding on the conventional limitations of armed forces on land and sea or of budgets relative thereto. That is to say, limiting the amount of money to be expended on military establishments. This was popularly known as the "disarmament conference."

The record of the proceedings of this conference brings out the practical difficulties in arriving at any international agreement as to limitation of armaments. The discussions are illuminating. They brought out the striking fact that no nation was willing to give up an existing naval or military superiority.

It appears sufficient to refer to the proceedings as published by the Carnegie Endowment for International Peace and to state that no understanding as to limitation of armaments could be arrived at, the conference expressing the wish that the governments themselves make a more thorough study of the question. This is what they arrived at:

The conference expresses the wish that the Governments, taking into account all the propositions made at this conference, should study the possibilities of an agreement concerning the limitation of armed force on land and sea and of war budgets.

That is as far as they got. They referred it to the various Governments for further study. ✓

The discussion in the 1899 conference clearly shows that in consideration of any world-wide limitation of armaments the entire subject must be included, not merely the naval side. It was specifically pointed out that coast fortifications and navies are closely related and involved in limitations upon either, and it would not be difficult for any student of warfare to develop these relationships further. In 1902—

Mr. BRITTEN (interposing). In 1902?

Admiral BADGER. In 1902.

Mr. BRITTEN. Did any one of those countries have a navy at that time?

Admiral BADGER. Yes; they had a considerable navy, and they were building more.

In 1902 Chile and the Argentine Republic agreed, owing to the initiative and good offices of the Government of Great Britain, to a five-year reduction of naval armaments on the conclusion of which, it was not renewed.

The above convention between Argentina and Chile for limitation of naval armaments represents a special case. Since a land campaign was very difficult—because of the mountain range that divides the two countries, running north and south—limitation of forces on shore was apparently not considered. This was the first case where they considered only naval armaments. In preparation for possible war, the principal activity was directed toward the increase of capital ships, and so the limitation of armament was confined to checking that activity. In Article I of that convention it is stated that—

With a view of removing all motive for uneasiness or suspicion in either country, the Governments * * * desist for acquiring the vessels of war now building for them and from henceforth making new acquisitions.

It was evidently considered that a removal of these capital ships being built for them abroad would restore tranquility to the minds of the peoples of the two countries. Such a special condition is rarely

apt to arise, and the convention was only a temporary measure as the two countries have since acquired capital ships from abroad.

Mr. BRITTEN. Just there, Admiral, may I suggest that parts of the coast lines of those two countries by sea are several thousand miles apart.

Admiral BADGER. Yes.

Mr. BRITTEN. I can not see why it was necessary or why either one should assume that the other would attack it by sea.

Admiral BADGER. Nevertheless, that was the danger they apprehended, that the fleets might go around and raid or capture their coast cities.

Mr. HICKS. There are parts of their coast line several thousand miles apart.

Admiral BADGER. In 1903 the Argentine naval budget was \$4,-000,000.

Mr. BRITTEN (interposing). That is the naval budget?

Admiral BADGER. That is the naval budget; and in 1920 it was \$14,000,000. In Chile the 1903 budget was \$2,000,000 and in 1917 it was \$7,000,000. So they did not stop acquiring ships.

In 1907, when at the second Hague conference, Great Britain brought up the question of continuing the study of the limitation of armaments, seconded by the representatives of the United States, the conference waived consideration of the subject, and contented itself with renewal of the wish of 1899 in the following terms:

The second peace conference confirms the resolution adopted by the conference of 1899 in regard to limitation of war budgets. And in view of the fact that the military budgets have considerably increased in all the countries since that aforesaid year, the conference declares that it is highly desirable that the governments again take up the serious study of this question.

So they did not get very far that time.

The CHAIRMAN. They got some more money.

Admiral BADGER. At this time, in 1907, it was stated by an American correspondent, Mr. Elmer Roberts, that in Berlin—

A considerable body of influential opinion inclines to the belief that Great Britain's proposal to circumscribe armaments is directed not so much against Germany as against the United States.

The idea is developed in this way: Since England has a navy three times as powerful as Germany's and is confident of being able always to maintain a two-power European standard, the only power in the world capable of building a fleet equal to Great Britain's is the United States.

Taking a look far ahead the ruling minds in London would regard it as a master stroke in statesmanship to limit the expansion of the American Navy by America's own consent and before the latent ambitious of the Republic are aroused.

Mr. Roberts of course only reflected the German point of view at that time.

In 1913, the subject of a naval holiday to apply to Great Britain and Germany was broached in Parliament by Mr. Winston Churchill, the First Lord of the Admiralty. The gist of this proposition, as evidenced by Mr. Churchill's speeches, was that the status quo of Great Britain's marked naval superiority was to be maintained.

The CHAIRMAN. That is when he was possessed of great fear.

Admiral BADGER. In March, 1914, Sir Edward Grey, minister of foreign affairs, announced in Parliament that no proposal to the German Government for a limitation of armaments had been made except in public speeches.

Each nation's world position in geography, in riches, in natural resources, in manufactures, agriculture and population together with her people's ideals lead her people and government to establish what seems to them to be a wise expenditure as to armed strength, and a wise balance as to percentage expenditure upon army and navy.

Every nation must decide this for herself. She can not place unlimited trust in the perpetuity of common interests and mutual good will between her and her neighbors.

It is beyond question that the people of this as well as all other countries favor limitation of armaments to such an extent as will not endanger their own safety and interests.

The problem is full of difficulty, for each nation, influenced by geographical location, commerce, national policies, racial characteristics, etc., differs as to the amount of military and naval force necessary to make it safe from enemy encroachments upon its territory or interference with its just rights and policies. Putting it candidly, the nations are not willing to put implicit trust in each other and it must be acknowledged that a study of international history affords good reasons for that unwillingness.

Doubtless some compromise agreement may be reached if seriously and honestly sought, but so far as navies are concerned I think it will probably have to be along the lines of equality of sea power.

There is difficulty and danger in that too, for such an agreement may lead in the future even more than in the past—if possible—to secret offensive and defensive alliances. The greatest danger of all would be so to tie our hands by treaty or agreement as to limit our independence of action as regards armaments for self preservation should changed international conditions demand immediate action on our part.

In any case, it would be unwise and dangerous for the United States to adopt a policy of disarmament or limitation of armament in advance of the other interested nations of the world. When such a policy is put into effect it should bind all alike and not put us in a position of inferiority, from which, by the terms of the agreement, we could not extricate ourselves.

NAVAL BUILDING PROGRAM.

The 1916 building program already authorized should be completed before any rest periods or limitations of sea power are agreed upon. That is my firm belief.

Mr. BRITTEN. You look upon the 1916 program as ships in fact?

Admiral BADGER. Ships in fact, yes. The United States building program since 1903 has tended towards equality of sea power with the strongest. In 1915 the General Board definitely recommended such a building policy. It has been directed against no nation or group of nations, but was adopted purely as a matter of national safety. The great merchant fleet that we are now making every effort to establish renders necessary, more than ever, a powerful navy for its protection. In all history it will be found that no nation has ever been able to establish and maintain a great merchant marine without a corresponding navy to assist and protect it. ✓

✓ The United States building program authorized in 1916 will, if completed, give us for the first time substantial equality in power, if not in numbers of ships, for our battle fleet. Nothing has occurred since its authorization to reduce the fighting value of the units of that fleet so long as the fleets of other nations possess similar units. It would be the height of unwisdom to pin our faith and change our practice upon mere theories as to the future development of new weapons, but that does not relieve us from the necessity of developing to the utmost new weapons and inventions while opportunity offers. When we are assured of their efficiency the time will have arrived to make radical changes in existing and well-tried types. That applies to battleships as well as everything else.

The prosecution of the 1916 program to completion should not act to prevent our adding to the Navy such new or important types of vessels as will serve to round out the fleet and make it modern in all its units.

✓ It must be understood that the World War caused our building efforts to be diverted almost entirely to the construction of anti-submarine craft—destroyers, submarines, chasers, mine-laying and sweeping vessels, etc.—otherwise the battleships and battle cruisers authorized in 1916 would, by this time, have been completed, or nearly so. During the war the abundance of capital ships possessed by the allied nations made it safe for us to delay, but such conditions are not likely to recur. In the future, as at all other times in the past except during the World War, we shall have to rely, in all probability, solely upon our own state of preparedness. By that I mean we are not likely to form alliances for war.

✓ Progress is continuous. The battleship of 1920 is a very different creation from that of 1900. The battleship of 1940 will probably differ from that of 1920 quite as much, but that is no reason why we should in the meantime risk a state of unpreparedness in comparison with other maritime nations. It should be emphasized that the apparent congestion of capital-ship construction now is only apparent, not real, and is due to the enforced diversion of our building operations to other types of ships, made necessary by the unexpected extension of submarine warfare upon merchant vessels. In this connection it is worth while to note that our antisubmarine building program was adopted in large part to supply deficiencies in these types of craft, in the allied navies as well as in our own. From this point of view it was not only a national necessity but also an international one.

THE BATTLESHIP VERSUS AIRCRAFT AND SUBMARINES.

The attack upon the 1916 program has been mainly directed upon the battleships and one of the principal arguments used is that the British Government doubts the future value of that type and is now building none. I should like to read to the committee the statement of the first lord of the British Admiralty on that subject in submitting the naval estimates for 1920-21 to Parliament. He said:

There has been some criticism of the maintenance in commission of the present types of vessels, especially in regard to the capital ship. A contrary policy has been openly advocated, this policy being based, it is presumed, on the idea that the battleship is dead and that submersible and air vessels are the types of the future.

The Naval Staff has examined this question with extreme care, and as a result we profoundly dissent from these views.

In our opinion the capital ship remains the unit on which sea power is built.

So far from the late war having shown that the capital ship is doomed, it has, on the contrary, proved the necessity for that type. On the German side the whole of the submarine campaign against merchant vessels was built up on the power of the high sea fleet. On the British side the enemy submarines in no way interfered with the movements of capital ships in carrying out operations; destroyer screens, new methods of attack, and altered tactical movements defeated the submarine.

Nor at present could the Board of Admiralty subscribe to the statement that aircraft doomed the capital ship. Aircraft are certainly of the highest importance in naval tactics, as regards reconnaissance, torpedo attacks, and artillery observation, but their rôle in present circumstances is that of an auxiliary and not a substitute for the capital ship. The past history of this question must be taken into account; many times has the doom of the battleship been pronounced. The introduction of torpedo craft was believed in certain quarters over 20 years ago to have settled its fate. The Board of Admiralty at the time refused to be carried away by the attractiveness of the idea of building small, cheap torpedo craft instead of battleships, and they proved to be right. History has shown that the introduction of a type to destroy the capital ship has been quickly followed by the evolution of counter measures which sustain its power.

We therefore believe that the battleship must remain the principal unit, and that the fleet tactics and tactical training must be carried out with the battle squadron as the main unit. Nevertheless, it must be emphasized that although the battleship remains, its type may require to be altered. Advances in electricity, in the internal-combustion engine, and in science generally will inevitably necessitate an eventual change of type, and it is one of the principal functions of the naval staff to keep continuous watch on scientific development, with the object of insuring that the type of capital ship designed meets the requirements of the future. It is even possible that the present battleship will change to one of a semisubmersible type, or even of a flying type, but such types are visions of the far future, not practical propositions of the moment. By gradual evolution and development the types forecasted may arrive, but the immediate abandonment of the capital ship in favor of a visionary scheme of aircraft and submarine would leave the British nation destitute of sea power and without the means of progressive training.

The CHAIRMAN. How do you account for the curtailment of the construction of new battleships after that speech of Lord Churchill?

Admiral BADGER. I will tell you what I think is the reason. I have not any special information to go on, but I think it was the economic situation in England and the fact that having already a vastly superior navy to any other that they could afford to wait until the financial condition improved.

The CHAIRMAN. One month ago England had 1,588,442 tons of ships, and America had 779,193 tons.

Admiral BADGER. Pretty nearly twice as much.

The CHAIRMAN. And Japan had 340,596 tons. That statement of figures may be the reason why England has suspended its construction of ships at this time.

Admiral BADGER. I think that is what I have stated.

The CHAIRMAN. Do you know whether Lord Churchill has changed his views since he delivered that speech?

Admiral BADGER. I do not.

The CHAIRMAN. He probably still is in favor of a naval holiday.

Admiral BADGER. Probably.

Mr. HICKS. I was going to ask you, Admiral, what distinction there is between the submarine and the submersible?

Admiral BADGER. The submersible is not supposed to go entirely under the water. She has to be able to lower herself in the water to a condition of "awash" and only have her battery above the surface. The French have a somewhat different definition but I

think what I have said is generally accepted in this country. Under the French classification all of our present submarines are also submersibles.

Mr. HICKS. Will they be large vessels?

Admiral BADGER. They might be.

Mr. HICKS. Battleships?

Admiral BADGER. I think there is no limit to the size. It makes a rather delicate machine, and naturally if you make a mistake about your balance and buoyancy, you may keep on going down.

Mr. HICKS. How far has the development gone in making the big battleship submersible?

Admiral BADGER. There are no large submersible vessels that I know of. We, of course, can submerge the submarine to what is called the awash condition.

Mr. HICKS. I mean outside of the submarine.

Admiral BADGER. So far as I know, there is no such vessel.

Mr. HICKS. Are they experimenting along that line?

Admiral BADGER. I do not know of any experimentation along that line.

Mr. HICKS. That term seems to be used a good deal.

Admiral BADGER. It is a term which has been used for a number of years, but I do not think they have gone into it. The General Board in no way minimizes the importance and possibilities of submarines, aircraft, and aircraft carriers, but urges that every effort be made in our Navy to lead in their future development. It also recognizes our shortage in surface cruisers.

With regard to battle cruisers, the General Board has said:

The value of the battle cruiser, about which there had been some previous difference of opinion, was fully demonstrated during the war. The generally accepted practice abroad is for a greater proportion of battle cruisers to battleships than we have as yet contemplated. The announced policy of one nation is for one battle cruiser to each battleship.

The money, as I understand it, has been appropriated to carry on such a program in that country.

Mr. PADGETT. What country is that?

Admiral BADGER. Japan.

Mr. OLIVER. That was 8 and 8?

Admiral BADGER. That was 8 and 8. The General Board goes on to say:

The United States now has authorized, but just commenced, six battle cruisers, none of which will probably be completed until well into 1923. In order to obtain equality of fleet power in these important vessels it will be eventually necessary to provide for an increase, but in view of the economic situation and the fact that six such vessels are now under construction the General Board recommends that one only be laid down in the immediate future and that one in the fiscal year 1923.

And I may say that is to meet advances in other navies.

Mr. OLIVER. In that connection, have you information as to whether those that are to be built by Japan equal in speed or in gun-power those being built for us?

Admiral BADGER. So far as we are informed they are about the equal of the latest designed ships.

Mr. OLIVER. They carry 16-inch guns?

Admiral BADGER. They carry 16-inch guns, so far as our present information goes.

In regard to cruisers the General Board says:

CRUISERS.

The United States is very deficient in modern vessels of the cruiser class. In fact, until the completion of the 10 scout cruisers authorized in 1916, the majority of which are expected to be ready for commissioning in 1922, we are without any modern vessels of the cruiser type at all. We have about 15 such vessels including the 8 armored cruisers still having some military value but their speed does not fit them for the duties now demanded of such ships.

The need of the United States Navy for a large number of these vessels can not be too strongly stated.

The General Board there recommended some more cruisers of the 10,000-ton type.

The CHAIRMAN. We have that recommendation.

Admiral BADGER. The General Board also recommended some destroyer leaders.

In regard to airplane carriers, the General Board said:

AIRPLANE CARRIERS.

The development of aircraft for naval use is now inviting the close attention of naval strategists and tacticians. There can be no question that their future employment in connection with naval operations will introduce new problems of attack and defense of far-reaching importance. No one can foresee what the final rôle of aircraft will be, but we know that their possibilities are great, and it is now perfectly evident that the navy skilled in the use of airplanes and well provided with the most modern types will have a great advantage in war over a navy not trained in their use or not well supplied with aeronautical material.

It is not too much to say that the influence of airplanes upon scouting and information-gathering duties may revolutionize former naval practice along those lines, though the General Board does not believe that the necessity for surface vessels of the scout or cruiser type will be in any degree impaired by the use of aircraft as information gatherers.

Surface vessels will always be needed for use under weather and other conditions when aircraft could not be employed—for the patrol of sea routes, the protection of lines of communication, escort of convoys, screens for fleets, and numerous other duties for which aircraft are not suited.

Airplane carriers are a development of the war. They are to carry airplanes in considerable numbers and from which aircraft may fly and return as to a base. Many such vessels were employed in connection with the fleets abroad during the war and are still so employed; they have been found of great value. The United States Navy has none especially built for the purpose of possessing the necessary characteristics to meet all the conditions demanded.

Such vessels should be considered as an absolutely essential type in a modern fleet. For the United States Navy they are urgently needed. These vessels are not auxiliary in the usually accepted meaning of the term. They do not belong to the train; they are essentially combatant ships associated as such with the other ships of the fighting fleet. They are needed as soon as possible for training the air and the fleet personnel in the use of aircraft in connection with fleet organization and operations.

The General Board recommends that two of these ships be laid down in the fiscal year 1922, and one in each of the fiscal years 1923 and 1924.

I might say the large airplane carrier we have been talking about this morning will carry about 80 airplanes; that each carrier will carry about 80 airplanes.

Mr. AYRES. How many will one of the scout cruisers carry?

Admiral BADGER. Eighteen.

Mr. OLIVER. How many of the 80 airplanes will be fighting planes?

Admiral BADGER. You can vary it. Eighty is about the average. It depends upon how you make up the number. The torpedo and bombing planes are expected to be the same type. The plane that

can carry a bomb, instead of carrying a bomb may carry a torpedo. It is a combination plane. The scouting and observation planes are different from the bombing planes, and the fighting plane is a small fast plane. Any number of combinations can be made, but they will run anywhere from 60 to 80 for each ship, depending upon the size of the planes selected.

AERIAL BOMBING.

Mr. BRITTEN. It has been stated that the change in direction, the zigzagging and the change in the line of action of a battleship minimizes the danger of a torpedo attack. Would not that same condition apply to a ship being chased by a plane?

Admiral BADGER. Well, it might, Mr. Britten, but it is so uncertain when that bomb is let go where it is going to drop; you might run into it.

Mr. BRITTEN. Does not the same thing apply to the torpedo?

Admiral BADGER. Not exactly. The zigzagging was to prevent the calculations made a long time before, the calculations of the submarine on an approaching ship as to good torpedoing distance and position. For instance, a submarine 5 or 10 miles off of the bow of a ship will immediately steam as fast as it can on the surface to the place where it thinks that ship is going to be at the time the submarine can arrive there. Then when the ship does arrive, if the submarine has reached that position it is in just the place to do the greatest amount of damage. But if when the submarine gets there and before the other ship comes up it suddenly turns away at an angle of 45 degrees, then the calculations made by the submarine are wrong and it loses its opportunity. But in the case of the bomb, you do not know where that is going to fall.

THE BOMBING OF THE U. S. S. "INDIANA."

Mr. PADGETT. I want to digress a little bit. This morning Admiral Sims made the statement in connection with the bombing of the *Indiana*, that the bombing was done at an altitude of 6,000 feet and that they had 40 per cent of hits. As a matter of fact that statement is so very erroneous and exaggerated that I wanted to ask you if there is any reason why the facts should not be given?

Admiral BADGER. I do not know any reason, sir. I have some of the data here and I can give you some facts on the subject.

Admiral SIMS. There is the record. [Presenting chart.]

Mr. PADGETT. I have been given this record, that the bombs were dropped at 4,000 feet instead of 6,000 feet, and that there were 102 dropped and 10 hits, making 9.8 per cent of hits instead of 40 per cent of hits. I am asking you if that is correct?

Admiral BADGER. I do not know.

Mr. PADGETT. I have understood that is the official record.

Admiral BADGER. This is about the best I can give you.

Mr. OLIVER. This chart would show.

Mr. BRITTEN. This is a chart of bombs dropped at the *Indiana*, to which is added the imaginary line of a modern cruiser, as shown around the *Indiana*; and then a dotted line, 60 feet from the cruiser line.

Mr. HICKS. Where did the chart come from?

Admiral SIMS. The testimony I gave this morning was my recollection of a report that I read day before yesterday of the hearing of Gen. Mitchell in which it was stated that 41.8 per cent of the bombs hit the *Indiana*, or within 50 or 60 feet of the *Indiana*.

Mr. HICKS. This is Gen. Mitchell's chart?

Admiral SIMS. That is the same; you can take either one.

Mr. BRITTEN. Then your 42 per cent was based not necessarily on the actual hits, but on hits within 50 or 60 feet of the ship itself or the imaginary cruiser?

Mr. OLIVER. That was Admiral Sims's statement this morning.

Mr. PADGETT. In view of the controversy, I would like you to state whether or not it is correct that the actual hits were 10 out of 102, or 9.8 per cent, instead of 40 per cent.

Mr. OLIVER. I think perhaps your recollection may be a little in error. I think the admiral stated that the actual hits within 50 or 60 feet of the *Indiana* were about 42 per cent.

Mr. PADGETT. He stated there were 42 per cent of hits.

The CHAIRMAN. The old *Indiana* was bombed?

Admiral BADGER. Yes, sir.

The CHAIRMAN. Was there some reliable person there who counted the actual number of hits made?

Admiral BADGER. Yes, sir.

The CHAIRMAN. Then we will call him.

Admiral BADGER. It took a long time.

The CHAIRMAN. Who did the bombing? Did Gen. Mitchell do it?

Admiral BADGER. No, sir.

Admiral COONTZ. I may say, Mr. Chairman, it was done under the direction of the Navy Department.

The CHAIRMAN. Then how did this information get out?

Admiral COONTZ. I did not know that any information of that character had been given out. But it came out this morning, and I acquired my information from the officer who handled it that the height was 4,000 feet and that there were less than 10 per cent of hits. But I would like to verify that. I did not know that anybody else knew it. We did not give those things out.

The CHAIRMAN. Here is a chart with the names on it.

Admiral COONTZ. I never saw the chart before.

The CHAIRMAN. It purports to have a figure representing the *Indiana*, I presume. It is marked "Length 874 feet; breadth 80 feet, scale 1 foot." It says that the spots where the bombs dropped at the U. S. S. *Indiana*, modern cruiser, are shown around the *Indiana* by dotted lines, 60 feet from the cruiser.

Mr. VENABLE. I think possibly that this controversy is because of a misunderstanding and the difference in percentage may be accounted for in the same way. Admiral Sims stated this morning that there were 40 per cent of hits either on the ship or within a radius of the ship sufficiently close to do damage. That was his statement this morning. He said 40 per cent of hits. It may be that there were only 10 per cent which actually struck the vessel.

Mr. PADGETT. I will ask that they put in the record the facts, showing what actually occurred. There has been so much of a conflict of statements that we ought to have the actual facts.

Mr. VENABLE. I think you will find that the testimony shows that 40 per cent of the bombs fell on the ship or contiguous thereto, near enough to do damage to the vessel.

The CHAIRMAN. How does this information get out in such a manner that it becomes public property? I take it from Admiral Coontz's remarks that it would be with some hesitation that he would disclose the facts.

Mr. HICKS. When we had hearings on aviation and the item came up about target practice on the *Indiana*, Capt. Craven and myself both agreed that the result should not be disclosed publicly.

The CHAIRMAN. How does this information get out?

Admiral COONTZ. I do not know; I never heard of it before.

The CHAIRMAN. It was not intended that it should be disclosed?

Admiral COONTZ. Not that I know of.

Mr. BRITTEN. Both of these blue prints were presented before the Senate committee investigating this matter the other day. They were presented by Gen. Mitchell, and the confusion here this morning in regard to the testimony of Admiral Sims is brought about in this way: There are two charts, one of them showing the number of hits and the number of bombs actually fired at the *Indiana*. The bombs fired are shown on that chart dropped at 4,000 feet. The bombs shown on the other chart were dropped at 6,000 feet, and showed 41.8 per cent hits, and this was the chart on which Admiral Sims's statement was based, and is the chart that was before the Senate committee, presented to the Senate committee by Gen. Mitchell.

Admiral BADGER. Here are the remarks made by the office of target practice and engineering performance. This is not a report, but the remarks that were made. They say:

In order to ascertain the amount of damage that would result from a hit by aerial bombs, bombs of different weights of explosives were placed on different parts of the deck and exploded. Careful examinations were made of the damage resulting from each explosion and the record made for use in the study of future construction.

In a general way it was found that the damage to matériel from aerial bombs was local; that personnel in unprotected positions within the blast area would be destroyed that personnel inclosed in armored turrets would probably be not incapacitated, and considering the probable effect of defensive gunfire against aircraft at the low altitude necessary in order to be accurate with heavy aerial bombs against a rapidly moving target at sea, the entire experiment pointed to the improbability of a modern battleship being either destroyed or completely put out of action by aerial bombs. The percentage of hits actually made on the *Indiana* was about 11 per cent. Well prepared battleships have actually made between 10 and 15 per cent of hits at 18,000 to 20,000 yards. It is believed that the destructive effect of a 12 or 14 inch shell is much more serious than that of any bomb of present design.

That shows that that bomb is not going to be a very important factor in the future in its present state of development, and it shows what may be learned now from these particular experiments.

I want to say the General Board is most anxious and has repeatedly urged in its papers and letters for a number of years, and particularly recently, that everything should be done to put us in the front rank. They do not know yet, either in England or America, what are the best types of aircraft for naval aviation purposes. It can only be arrived at by experimentation, and experimentation can only be had by expenditure of money.

The airplane carrier offers great possibilities, and it is, I believe, and the General Board believes, absolutely essential that we should

have one or more at the earliest possible moment for that purpose. We must keep in the advance; we must not fall to the rear.

The CHAIRMAN. I would like to make some further inquiry about the results of the bombing of the *Indiana*. How long ago did you bomb the *Indiana*?

Admiral BADGER. In November.

The CHAIRMAN. I would like to know what the object of that was; was it done in earnest?

Admiral BADGER. They were trying to see what could be done.

The CHAIRMAN. What were the bombs loaded with; waste or powder?

Admiral BADGER. The bombs dropped were dummy bombs, loaded with sand.

The CHAIRMAN. Did they drop actual bombs on this ship?

Admiral BADGER. No.

The CHAIRMAN. What were the size of the bombs?

Admiral BADGER. The one that did the great damage was a 900-pound bomb, placed by hand and exploded.

The CHAIRMAN. Is there any one here who can tell us all about this? I want to know whether there were actual experiments made on this ship with real bombs, or whether they were dummy bombs?

Admiral BADGER. They were dummy bombs dropped. They made experiments by dropping the bombs on the deck.

The CHAIRMAN. Did you put an explosive on the ship?

Admiral BADGER. Yes.

The CHAIRMAN. What was the size of it?

Admiral BADGER. That was given as a 900-pound bomb.

Admiral MAYO. They ranged from 200 pounds up to 900 pounds.

The CHAIRMAN. How many did they shoot?

Admiral MAYO. One hundred and two. You must remember we have never had any complete report on this. All we are going on is the memorandum from the office of target practice to the General Board as to the results, generally considered.

The CHAIRMAN. The impression I gained was that we could take a few airplanes and put battleships out of business. I want to know what the effect was of bombing that ship, if you did bomb the *Indiana*.

Admiral BADGER. Yes.

The CHAIRMAN. I mean a real, actual bomb with powder in it. Did you get the effect in that way?

Admiral MAYO. Not by dropping explosive bombs. They dropped dummy bombs as accurately as we could get them, and then exploded actual bombs on the ship to see what the destruction would be.

The CHAIRMAN. What would be the difference in the force between dropping of the bomb on the deck and the explosion of the bomb you laid on the deck?

Admiral MAYO. There would be some difference.

The CHAIRMAN. Why did you not drop a real bomb on the *Indiana*?

Admiral MAYO. Because they selected—

The CHAIRMAN. (interposing). Were you afraid she would blow up?

Admiral MAYO. They were trying to simulate the actual conditions that would be arrived at by dropping the bomb, and it also included an estimate of the penetration.

Mr. HICKS. By dropping bombs on the *Indiana*, 20 years old, you could not get any comparison of what the effect would be of dropping bombs on the modern *Tennessee*, where the construction is entirely different?

Admiral MAYO. I do not know how you could get any comparison.

Admiral BADGER. You might approximate it. If you put 900 pounds of high explosive near a turret it will do damage.

Mr. VENABLE. What was the effect of this bomb upon the deck?

Admiral BADGER. I do not remember that in detail. It displaced the turret; it injured the barbette; it blew down one of the smoke-stacks; it blew through the upper deck.

Mr. VENABLE. Would it have put that ship out of commission?

Admiral BADGER. No, sir.

Mr. PADGETT. How many bombs did you say were placed on the *Indiana*?

Admiral MAYO. As I recall the report, it said there were 102.

Mr. PADGETT. How many were exploded?

Admiral MAYO. I can not tell you that.

The CHAIRMAN. Is it not possible to protect the decks of these ships by netting?

Admiral BADGER. No, sir; I think not.

The CHAIRMAN. So that the ship is open to the bomb?

Admiral BADGER. Yes, sir; but she is open to the shell and the projectile, too. She has got to take her chances with all sorts and forms of projectiles. You might say that the dropping of bombs from a height is not a new form of attack at all. We have the mortar, which is exactly the same thing. Our coast defenses are armed with mortars of 12-inch caliber, but it is proposed to go to a 16-inch caliber. They throw these projectiles high in the air and they come down and strike a ship with the velocity gained in the fall, the same as a bomb from an airplane. The only thing is that it is believed that eventually the airplane can be more accurate in its shooting in the first place and that it can take that bomb anywhere it wants to.

The coast-defense bomb is only usable in a comparatively small area. The bombing machine can go to any target and distance and deliver its blow at that place. You have got to meet each new weapon with a corresponding weapon to overcome it. We have already the anti-aircraft gun, but that is not very accurate. Nevertheless, occasionally it scores a hit. Then we have the airplane itself, which is the true defense against air attack.

The CHAIRMAN. Do you not think that experiments might be actually made on one of the battleships such as the *Alabama*, which went into commission 20 years ago, that would be very useful to us?

Admiral BADGER. It would be more complete, Mr. Butler, and if you are willing to spend the money there is no reason why it should not be done. But what they wanted first was accuracy, and second, they wanted damage, and they get them at less expense.

The CHAIRMAN. As Mr. Hicks suggests, of course the modern ship would be better able to resist such attack than the old *Alabama*.

Admiral BADGER. We hear a great deal—this is all speculation—about 200 or 300 or 400 airplanes that are going to come out and drop bombs in great numbers around a ship. I have never flown myself, but I should hate to be up in the vicinity of 200 airplanes

all dropping bombs on a small mark like that at once. The idea is to meet the attack and repel it. It is going to be very serious, but the idea is to meet it with similar weapons, and any commander who gets himself into a position where he is helpless—if he could have avoided it—is in the same position as any commander who tries to carry 10,000 men into the midst of an army of 100,000 men. He is sure to be thrashed. When he meets that army he should be prepared to meet any form of attack that is likely to be used. So it is with this proposition.

Our fleets will have to be prepared to meet the offensive of the enemy's aircraft in the same way they have to be prepared to meet the offensive of his guns or his torpedoes, or anything else. We have to be prepared, and our fleets have got to contain everything necessary for the defense as well as the offense.

The CHAIRMAN. That ship will have to take her chances along with the others?

Admiral BADGER. Yes.

Mr. OLIVER. The weather conditions will also enter into the proposition at sea?

Admiral BADGER. Yes. It must always be remembered that bombs are very dangerous and the possibilities of aircraft are very great. All that I have been trying to say is for the purpose of advancing the necessity for one or two airplane carriers to be provided for at this session of Congress.

BUILDING PROGRAM—AIRPLANE CARRIERS AND BATTLE CRUISERS.

Mr. HICKS. What, in your judgment, is the most important need of the Navy, after we get the 1916 program completed? What is the one thing you would rather have above anything else?

Admiral BADGER. I would rather have an airplane carrier to start with than anything else. It should have priority. The General Board asked for quite a number of ships. We asked for one airplane carrier, if we were cut down to the lowest limit and could not get any more. But we want two. We want five cruisers of about 10,000 tons to start. We want two submarine cruisers of large cruising endurance, and two submarine mine layers. The airplane carrier would be of about 35,000 tons displacement.

Mr. HICKS. The first in importance is the airplane carrier?

Admiral BADGER. Yes; the first in importance is the airplane carrier.

Mr. HICKS. Do you think it would be possible to change the battle cruiser *Ranger* into an airplane carrier at the present stage of its construction?

Admiral BADGER. I do not, sir.

Mr. HICKS. The expense would be too great, would it not?

Admiral BADGER. It is a pretty expensive operation. The whole interior structure of the ship would have to be changed, and the detailed design has not been made. But we need to strengthen our Navy with battle cruisers. It is only a question of money, but that, of course, is a serious question now. But we can not eat our cake and have it too. We can build a carrier and build a battle cruiser also.

Mr. HICKS. Of course I appreciate the fact that the only ship we are now building that could be converted into an airplane carrier would be a battle cruiser, because of the necessary speed. The battleships we are building have a speed of 25 knots and there would be no use in trying to convert them into airplane carriers because the speed would be a handicap.

Admiral BADGER. Yes. Of course, speed is very important, and I agree with Admiral Sims that we ought to have it. But there is one other question in reference to speed for the airplane carrier beside that of making an easier landing platform. Great speed in the carrier is needed for its use along a scouting line, to keep up with the scouting vessels of the fleet. The speed of the battle cruiser is 33 knots. We tried to get 35. The speed of the carrier, which should be the same as that of the other ships, is not entirely for ease in landing on her deck, but in order that she can be in the scouting line with the fast ships of the information-gathering type. She could cover a greater territory if she had this high speed.

I may say that the Director of Naval Aviation, in a hearing before the general board, stated that the *Langley* would be good for the preliminary training in landing and taking off from the ship and they would gain great information from her. He further stated that in considering the subject of changing the 7,500-ton scout cruiser to airplane carriers that if he could be assured that they would build a carrier of the type that we have been discussing, the large 35,000-ton ship, he did not think it was necessary to change the scout cruisers.

Mr. PADGETT. As a matter of fact, would not the scout cruisers or any other converted ship be a makeshift?

Admiral BADGER. It would be a makeshift, and furthermore it is the same thing as with the *Langley*. The type of plane best for the converted light cruiser might not be best for the larger ships, the proposed carrier.

Mr. PADGETT. The scout cruiser converted would in no sense adequately answer the purpose?

Admiral BADGER. No; we believed the scout cruisers were urgently needed and that the Government should give us properly designed and built ships for aviation purpose.

Mr. HICKS. How do you or the General Board assess at the present time the relative importance of aviation as against a battleship? I asked a similar question of Admiral Sims this morning.

Admiral BADGER. We do not assess it at the present time very high. We do not know what is going to happen in the future; but up to the present time the actual developments do not lead us to believe that it is a very serious menace.

Mr. HICKS. Would you assess it at 25 per cent?

Admiral BADGER. No; I will give it 10 per cent; that is, for the present. We do not know about the future.

Mr. OLIVER. What do you think its assessable value will be three years from now?

Admiral BADGER. I can not tell you that.

Mr. OLIVER. I think that is a relevant question. It is perfectly proper to take into account what you have said as to the importance of aviation, and the further fact that you recognize that other nations have provided airplane carriers and are experimenting with airplanes.

Admiral BADGER. Yes.

Mr. OLIVER. Assuming that, without authorizing any airplane-carrying ships, we go on and complete our 1916 program, we will be in this position: We will have a strong navy of cruisers and battleships but no airplane-carrying ships to protect them, and it requires about two years to build an airplane-carrying ship.

Admiral BADGER. Yes.

Mr. OLIVER. So we would have to wait two years before we would really be on an equal footing with many other countries now providing their navies with airplane carrying ships?

Admiral BADGER. That is exactly so, and I do not see how you would help the matter very much by taking one of the battle cruisers to-day.

Mr. OLIVER. I am not urging that.

Admiral BADGER. You would have to largely remodel it.

Mr. PADGETT. The General Board is urging and insisting upon up-to-date airplane carriers.

Admiral BADGER. And that is what we say, that we ought to have both carriers and battle cruisers. You have got to have in a modern fleet all types that are necessary to make for safety in the presence of a well-outfitted enemy. We should have at least an up-to-date airplane carrier now.

Mr. OLIVER. In emphasizing the importance of building an airplane-carrying ship it is a mistake to give it only a 10 per cent assessable value.

Admiral BADGER. At present.

Mr. OLIVER. I think from your own statement it is entitled to a 100 per cent value, if it has the possibilities you think it has.

Admiral BADGER. You misunderstood me. I said at the "present moment" the danger from an aviation attack has only a value of about 10 per cent.

Mr. OLIVER. I can not imagine anything that would be more embarrassing than a situation we might be driven into, if we build a great fleet of dreadnaughts, and neglect to provide the essential auxiliaries to protect them from aerial attack?

Admiral BADGER. We will have aeroplanes, but we won't have them properly carried.

Mr. OLIVER. I understand that—understand Congress acts now.

Admiral BADGER. And that is the reason that I say the naval appropriation bill gives us no increase whatever over the 1916 program. We say we can struggle along, although we do not like it, without any of the other things that have been recommended since 1916, and which includes a very serious shortage of cruisers. We say that we ought to have some airplane carriers in order to look out for the future. We ought to have both and any conversion will be in the nature of a make-shift. Therefore the General Board asks for at least one real airplane carrier and would like two.

Mr. BRITTEN. Then, making my own deductions from some of your remarks, the General Board (and I presume you are speaking for the General Board) is opposed to any cessation in the construction program at this time?

Admiral BADGER. Absolutely.

LIMITATION OF ARMAMENTS.

✓ Mr. BRITTEN. The General Board at this time is opposed to any agreement for disarmament that is not an agreement among the nations of the world?

Admiral BADGER. I would not go so far as that, sir. Any agreement among the nations which, in a naval sense, would count.

Mr. BRITTEN. The principal nations?

✓ Admiral BADGER. The principal nations; yes. And the General Board is further opposed—or, I won't speak for the General Board, but I am—I am further opposed to any agreement which will leave us, when that agreement goes into effect, with the inferiority of naval armament. When it goes into effect, my opinion is that the United States should be on substantially equal terms with the strongest and then, after you get there, you can reduce just as much as you please—after you get there.

✓ Mr. BRITTEN. You can not see any reason why the American Navy should not be at least the equal of Great Britain's?

Admiral BADGER. I can not.

Mr. BRITTEN. Notwithstanding her island possessions and her colonies, and her great commerce on the high seas, you think that the American Navy should be at least the equal of Great Britain's?

✓ Admiral BADGER. I think the United States can be trusted to make good use of her fleet just as well as we are expected to trust any other nation. We are now going out for the world's commerce or, rather, for our share of the world's commerce. The Government has built a great fleet of merchant ships, spent three billions of dollars, or whatever it may be, and we now have under Government control something in the neighborhood of 1,600 modern commercial ships that trade in all parts of the world. And if war should come, we want to be prepared to protect that commerce and at least to have an equal chance of keeping our ships on the high seas with any other nation?

Mr. BRITTEN. And even though we might not be in the war physically?

Admiral BADGER. Even though we might not be in the war physically.

Mr. BRITTEN. And the only way we could protect our commerce on the high seas during a war between two other great powers, for instance, would be to have a Navy that could substantially, on the high seas, back up our desires, and that is what we have not had in the past.

Admiral BADGER. That is what we have not had in the past, and that is what we have in sight now. And now we do not want to stop it.

The CHAIRMAN. Thank you very much, Admiral Badger.

Statement of REAR ADMIRAL BRADLEY M. FISKE, Retired.

TORPEDO PLANES AND AERIAL TORPEDOES.

The CHAIRMAN. Admiral Fiske, you have written a good deal on the subject of what is known as a torpedo plane, and as you have noticed, of course, we have been making some inquiry to-day as to

what effect modern inventions in electricity and in aviation may have upon the value of the battleship. If you will talk to us on that subject and give us the benefit of your views, we will be very greatly obliged.

Admiral FISKE. Shall I start at the beginning?

The CHAIRMAN. Start just wherever you please. I know you have given this subject a great deal of attention, or at least you have written a great deal on it, and we have all read what you have had to say.

Admiral FISKE. When I was on the General Board the first time as a captain, I was in charge of war plans, and the question of a war with a certain foreign country, a distant foreign country, was very much up, and the danger (at least some people thought it was a danger) of their taking the Philippines, and the Philippines are right there. And I pointed out that if we had a large number of airplanes in the island of Luzon, that if any nation came to invade the island of Luzon it would have to go through a long process of getting the troops there and getting the boats out and getting the troops to the beach and getting stuff out on the beach and forming, and if we had a large number of airplanes there they could drop bombs on the transports and open boats and the men getting out on the beach and forming, at any time, and we could prevent them absolutely taking any of the Philippine Islands. And I got all the General Board to agree with me, including Admiral Dewey; but the aid of operations was not there and when he came in he denounced the whole thing and stopped it altogether.

Mr. KRAUS. What year was this?

Admiral FISKE. The winter of 1910, 10 years ago.

Mr. KRAUS. Who was the aid of operations that year?

Admiral FISKE. Admiral Wainwright. Then I proposed that we could get these airplanes and put torpedoes under them and use them for torpedoing. Well, that did not seem to be a very good idea to many of them, and I dropped that. I went on then for two or three years talking this thing up with different people, as it did not seem to be a very bad thing to me. It seemed to me that it could be done and it seemed to be practicable, many years before I got the basic patent on the radio control of torpedoes. But evidently it did not seem practicable because I could see no way of doing it. Then when the airplane came in, I thought I could have a man in an airplane who could drop this torpedo and then I got to talking with an old friend of mine, Park Benjamin, who was a patent attorney and who had taken out a great many patents for me, and I said, "I believe that plan of mine is thoroughly practicable and I will tell you why," and he thought so, too. And then it went on for a while after that and I decided to apply for a patent and did, in 1912. And since that time there has not a day gone by I have not thought of it in one way or another. Of course I look at it from a biased standpoint. And this idea has come along and has been getting more and more friends ever since it was started. This matter came out in the public press almost immediately after my patent was granted in July, 1912, and in 1913 the British began to experiment with it, and also the Italians, and later the Germans, and in 1915 a young English lieutenant, or lieutenant commander, took his transport in the

Sea of Marmora, and I have been told since, on authority I do not question, they sunk four ships. They absolutely sunk them.

Mr. BRITTEN. How was the torpedo launched?

✓ Admiral FISKE. I do not know. It was from a hydro-airplane. I got that information in March, I think, of 1916, and I knew it when I testified before this committee before, but it was confidential and I could not give it out. I got it from a man named Morton, a commander in the British Navy over at Constantinople, that this thing happened the year before, in August, 1915. On the 1st of May, 1917, two torpedo planes, German, attacked a British ship off the coast of England, in the North Sea, and sunk her. One of the torpedo planes was brought down and lost, but she sunk the ship, and it was published broadcast. It was given out by the British Admiralty itself a few months afterwards.

The CHAIRMAN. What kind of a ship was it?

Admiral FISKE. A British steamship of 3,300 tons.

The CHAIRMAN. Not protected in any way?

Admiral FISKE. No, I believe not; just a regular tramp steamer. And I have heard since, from authority I do not doubt, they got another British ship in the same year, 1917. In the case of the Sea of Marmora, there was a perfectly smooth sea, I believe, and all the conditions were very good; but in the case of the North Sea, the conditions there, so far as I can find out, were those of absolute orthodox attack. The thing simply did it, that is all. It is not a question of whether she could do it or not; she did launch a torpedo and sunk a ship.

Mr. BRITTEN. Do you know how the torpedo was launched?

Admiral FISKE. Yes, the torpedo was dropped from an airplane.

Mr. BRITTEN. Do you know the height from which it was dropped?

Admiral FISKE. No, I do not.

Mr. BRITTEN. Approximately?

Admiral FISKE. I do not know that; but it was launched in the air. It was an absolutely orthodox attack, just as has been the intent. It had all the elements in it.

Mr. PADGETT. Do you know what ship it was?

Admiral FISKE. The Gena. It was given out by the British admiralty. I have heard it countless times since, and there is no question about it. With regard to the other ship, I do not know; but I have heard from British officers and others it is a fact they lost two ships that way. There was a case in which every element was present, except—I was going to say except the element of fire, but the element of fire was present, because the torpedo plane was brought down by that ship. She had guns and fired on them. How close it was, I do not know, but I know the torpedo was dropped and hit the ship at which it had been sent.

Mr. HICKS. Was that torpedo controlled by radio?

Admiral FISKE. No, it was not; it was a regularly controlled 1,000-pound torpedo, I believe, which the Germans used. They had quite a number of them at that time.

Mr. KRAUS. Have you any information as to how many other cases there were where it was tried where it failed?

Admiral FISKE. No, I have not, except—yes, I have one. I answered rather hastily. A torpedo was dropped from some Ger-

man plane and, as I recollect it, it went into the harbor and struck on a sand bar, or did something like that; but I know there was one other case where the Germans did discharge a torpedo from an airplane, but it was not effective. It ran ashore or did something of that kind.

The CHAIRMAN. But it floated off all right; it was not broken up?

Admiral FISKE. Yes.

The CHAIRMAN. I recall the instance you speak of; it floated off, but it simply did not hit the target.

Admiral FISKE. It simply did not hit the target, that is all.

The CHAIRMAN. There was no damage done.

Admiral FISKE. Not that I heard of. All that I know about the subsequent development of it, I get quite informally, but from a number of sources, some official and some not; that is, that the British have been going ahead with it with a great deal of earnestness and scientific accuracy and a great deal of success. They have made two or three—I do not know how many—attacks by squadrons of torpedo planes and they have been successful, and so very successful they have reported the exact number of attacks and the exact number of hits. And that they have made these concerted attacks where a number of them came in together and delivered this charge, I do not think there is any reasonable question. Any in our Navy I understand we have been going ahead with it very seriously; that is, within the last year, and dropping torpedoes from various heights and they are still engaged on it. And they expect to be able to drop torpedoes in a high sea, from a proper height. There is no reasonable trouble about finding how high they are above the water, that they are close enough, and there is no reason why they could not drop them in the heaviest kind of a sea, no reason why the torpedo should break up and no reason why the torpedo should hit the water too hard. There are a number of difficulties in the way, but they are all of a very simple character and I do not find that anybody who has been engaged in any experiments with it expects any serious difficulty. The people who do expect difficulties and so on, I find are people who are not familiar with what is being done.

Mr. HICKS. Can you tell us what is the greatest height from which you can drop a torpedo without injury to the torpedo?

Admiral FISKE. I have heard different accounts. I think they have been dropped from 20 feet without any harm and sometimes they have been dropped from 20 feet and have suffered harm.

Mr. HICKS. The ordinary torpedo?

Admiral FISKE. The ordinary torpedo. I understand also they have been dropped from greater heights, but 20 feet is considered about as high as they can simply drop it. Of course, there are a number of ways by which you can ease the velocity of decent, by having a little string attached to the torpedo, going over a friction disk and by having some little device to break the string when the torpedo drops in the water; or like putting over an anchor in deep water, in order for it not to get too much headway, you tie the chain with heavy pieces of rope around it and when the anchor goes out the instant these strands break that checks it for the moment as the anchor goes through the water. There are a great many things like that which can be done, perfectly sailor-like tricks; there is no trouble about it.

Mr. HICKS. You think eventually that a torpedo could be dropped from a height of a thousand feet?

Admiral FISKE. Oh, yes; by putting a parachute on it, would be the proper way then; but personally I do not see any value in dropping a torpedo from a height of a thousand feet.

Mr. PADGETT. What is your plan for overcoming the power and force of gravity at a thousand feet?

Admiral FISKE. The parachute is one thing which I believe they have tried with some success. And sometimes men drop from higher than that, and where a man can drop from higher than that you ought certainly to drop a torpedo.

Mr. PADGETT. A torpedo dropped from a height of a thousand feet, how long would it take to come down in a parachute?

Admiral FISKE. I think that can be regulated almost to a nicety after a few experiments, by developing the size and shape of the parachute. If it comes down and hits too hard one time or a little bit too slowly at another, by changing the parachute I think you could regulate it almost to a point.

Mr. PADGETT. I have seen a number of parachutes come down and the landing place was any wheres from a half a mile to 2 miles from where they expected to land. How would you overcome that with your torpedo? I have seen fellows come down in parachutes—

Admiral FISKE. How high did they come from?

Mr. PADGETT. I saw one come down from 1,500 feet and another one from 1,000 feet.

Admiral FISKE. Of course the higher they come from the more the difficulty.

Mr. PADGETT. And the fellow that came down from a thousand feet, I reckon he was 15 or 20 minutes coming down. He just drifted for 15 or 20 minutes and he landed a mile away.

Admiral FISKE. There was no reason—For instance, suppose you can drop a torpedo from a height of 1,600 feet; that will fall in the water at the rate of 32 feet a second. There is no use slowing it down to a greater degree than that. But, as I say, I do not see the slightest use in dropping it from those heights.

The CHAIRMAN. Get down closer to the water before you drop it.

Admiral FISKE. That has always been my contention. I do not see any value in it otherwise. In fact, there is a great disadvantage in it.

The CHAIRMAN. I have always had this in mind, in listening to naval experts and to military men. That it is possible to so contrive one of these ordinary flying machines as that it can carry a torpedo and can fly at a ship and go close enough to the water to launch the torpedo, so that the torpedo might be effective against the side of the ship. Of course, the man may be shot in the effort, that is true, but he takes a chance on that. Is that correct?

Admiral FISKE. Would you mind if I asked you to repeat that? I want to be sure I understand you.

Mr. BRITTEN. Let the reporter read the question.

(The question was read by the stenographer.)

Admiral FISKE. If I understand your question right, that is exactly the intention, Mr. Butler, and it is thoroughly practicable.

The CHAIRMAN. Then I am leading up to something that is real and substantial?

Admiral FISKE. Yes.

The CHAIRMAN. Do you know whether any real experiments have been made along that line?

Admiral FISKE. I understand the British have done it a number of times. You do not mean using a bomb as distinguished from a torpedo?

The CHAIRMAN. No, I mean a torpedo, one that might be dropped into the water from an airplane and discharged against the side of the boat; in other words, put the torpedo in the water with its nose on toward the ship and within striking distance and one that might be thoroughly effective. Is it possible to make such a shot as that?

Admiral FISKE. That is the intention entirely, if I understand you; that is the whole intention.

Mr. BRITTEN. Yes, the chairman's idea is the same as your own.

Mr. STEPHENS. Admiral Fiske, I noticed that Admiral Sir Percy Scott is quoted as having said, with regard to the possibilities of a torpedo carrying TNT—"I have a drawing of one carrying a ton of TNT. She is steered from the air by wireless and a high official connected with the British Air service Torpedo Department tells me there is no limit to the size of a torpedo; that torpedoes can be controlled from the air and, in fact at this moment they are controlling them from the air." Can you give us any enlightenment on that?

Admiral FISKE. I can not give you any exact information. I have seen that and I have heard a great deal of evidence to that effect, but personally (as I said, naturally I am biased as I invented that thing first, you know, and then the torpedo plane), but looking at it from the standpoint of tactics, from the way we handle things in battle, I prefer the simpler method. I have not a doubt under certain circumstances the other may be effective, also; but it is a much more difficult problem. Quite likely it will come along in time, because this is an era of change and nothing stands up long. And I would like to take this opportunity to point out—

Mr. PADGETT. Before you leave that, may I ask a question?

Admiral FISKE. Yes, sir.

THE CAPITAL SHIP: WILL IT BE DISPLACED?

Mr. PADGETT. With all you know of the airplane and the torpedo and the torpedo attack, bomb dropping, and all that, have you reached the conclusion to abolish the battleship and the battleship cruiser and the scout cruiser—to abolish the Navy in other words, except that?

Admiral FISKE. I would like to answer that question in my own way.

Mr. PADGETT. All right.

Admiral FISKE. I want to bring it up in connection with what I was just about to say about the capital ship. Now, the capital ship always has been the same as the capital anything else, it is the best. The capital ship is the best ship.

Now, a great deal of controversy, I think, has been a little mixed up with the assumption on the part of some people that the battleship is necessarily the capital ship. It is at the minute; there is no

question about that at all. But because the battleship is the capital ship just now is no reason that it should be a million years hence or a year hence or for any time, because, due to the rapid progress of research, experiment, invention, and discovery, we live, as it is common place to say, in an era of change. A great many people, in fact all of us, become accustomed to seeing a certain thing and we assume, unconsciously, that is finality. Now there is no such thing in the world as finality. If there was anything that was the final capital ship it was the galley, because she was a capital ship for 30 centuries. She was even the capital ship at the battle of Lepanto, as late as 1571, only a little over 300 years ago. Then the sail ship came along, and it was a long while before she displaced this other capital ship. And the sail ship became the capital ship, and in my lifetime the sail ship was the capital ship. Then, after the battle of the *Monitor* and the *Merrimac*, after the *Merrimac* came right out of Norfolk and came up and sunk the *Cumberland* immediately, like that (indicating), that brought in this new era of steam and iron ships, and so forth, but they did not really get the sailing ship crowded off the seas until pretty near 1900, or a little earlier than that, perhaps, certainly not before 1890. And here we are just when this battleship has got to be such a wonderful thing, nine-tenths of us have the idea she is finality, that we have got there and that is the end of it, that it is the culmination of human endeavor. And I think that is a mistaken point of view. Whether she will change or not must be left for time to determine, except this point—I want to impress this, although I am quite sure I am only paraphrasing what certain other gentlemen have said—that we must get to work and do this thing. It is perfectly idle to say you can not do this thing, but you must get to work on it. I say now we are the most inventive Nation in the world—

NAVAL BUILDING PROGRAM—AIRPLANE CARRIERS.

The CHAIRMAN. How can we do it? How can we do it with the expenditure of as little money as possible?

Admiral FISKE. Why, take this recommendation of the General Board and multiply it by two or three or four, or as much as you want to, but certainly give the two airplane carriers. Our fleet lacks those as much as anything else.

The CHAIRMAN. Would you interrupt the building program of 1916?

Admiral FISKE. I would much prefer not to do so, because I do not believe, as a sailor man, in letting go of one rope until you get another. I would not like to see this program cut down at all. I think this country is perfectly able to do both. But let us have two airplane carriers. The designs are practically made, they are there, and you have the greatest naval architect in the world right here in Washington, Admiral Taylor, and let him get to work and get behind it and get those things done instead of haggling about it. If you will go and do it, I would not like to say how quickly it can be done, but it certainly is within the resources of this country to get it built in a year and a half.

Mr. BRITTEN. I do not think there is any question about our capability if the plans are drawn, of building a plane carrier in a year and a half, or, at most, 24 months.

Admiral FISKE. Now, there you are; you can get it in a year and a half, and, meanwhile, go ahead with the other experiments and get at this bureau of aeronautics and get that done, and put a responsible man at the head of it and let him understand the country would get him by the neck if he does not do it right, and it would be done.

Mr. BRITTEN. Your suggestions were along that very line in talking to me over the telephone the other day. I said the British were not building any capital ships, and you said, "It depends entirely on what you call capital ships; they may be building a great airplane capable of carrying torpedoes and guns, and that might reasonably be construed as a capital ship."

Admiral FISKE. Of course, it is a capital ship. If it will do what I am sure it can do, we can make that a capital ship. And instead of the country being afraid of it and wanting to fight it off, that will be a thing to increase our naval power more than anything else.

Mr. BRITTEN. You think our fighting power on the high seas would be immeasurably increased—

Admiral FISKE. I do.

Mr. BRITTEN (continuing). By the addition of one or two plane carriers?

Admiral FISKE. Yes; but if you put in two, it is at least four times as good as one.

Mr. BRITTEN. I suggest one on the Pacific and one on the Atlantic.

Admiral FISKE. That is all right. That is fine; that is bully.

BATTLESHIPS VERSUS AIRPLANES AND AIRPLANE CARRIERS.

Mr. HICKS. Let me ask you this question, which I have asked Admiral Sims and Admiral Badger: In your judgment, in the assessed valuation at this time of aviation as against battleships, how would you assess aviation?

Admiral FISKE. I would put aviation ahead of battleships, and lest I be considered very extreme in saying that, I would like to point out in any organization you want to strengthen your weakest point. And even supposing for the moment that the airplane carrier is not as good as a battleship, nevertheless that is the weakest point.

Mr. HICKS. You said you would place the element of aviation ahead of the battleship?

Admiral FISKE. Yes.

Mr. HICKS. How much ahead; how far superior?

Admiral FISKE. Well, I am sure—I can put it this way: If there was to be a fight out on the ocean between an airplane carrier on the one side and two battleships on the other side, and I had to be on one side or the other, I would go on the airplane carrier rather than be on the two battleships.

Mr. PADGETT. In view of what you stated a moment ago, is not the necessity existing in our Navy for airplane carriers the controlling need of the Navy?

Admiral FISKE. Yes.

Mr. PADGETT. And was not your statement based upon it when you said that was the weak point in our Navy?

Admiral FISKE. Yes.

Mr. PADGETT. And what we need?

Admiral FISKE. Yes.

Mr. PADGETT. We have a number of fine battleships but we are lacking in airplane carriers and the controlling factor with you is the necessity existing?

Admiral FISKE. Yes.

Mr. PADGETT. And not the superiority in fighting value?

Admiral FISKE. Now, I say as between the two—I will put it this way: My main reason is as you say, Mr. Padgett. That is my main reason, and about 90 per cent as strong as that is the fact I believe the airplane carrier such as the Bureau of Construction has designed is superior in all-around fighting power to any battleship afloat to-day.

Mr. OLIVER. Have you examined the type they have designed?

Admiral FISKE. In the details?

Mr. OLIVER. Yes.

Admiral FISKE. No; I have not.

Mr. OLIVER. Do you think they meet the requirements?

Admiral FISKE. Admiral Taylor would know much more about that than I.

Mr. HICKS. There are very few details, as I understand; it is only in the rough at this time.

Mr. BRITTEN. The idea being a supercarrier, the very largest thing afloat.

Mr. HICKS. And of great speed.

Mr. STEPHENS. Would the introduction of this carrier develop or give opportunity for developing radio control of torpedoes?

Admiral FISKE. Oh, yes; certainly it would open up that whole subject to investigation, and I think we would find a lot of the brightest minds in this country right at work on that and shoving it right up ahead.

Mr. BRITTEN. They would work on it any way, wouldn't they?

Admiral FISKE. Oh, yes; but just as soon as it is assured—it will make a tremendous difference whether you gentlemen or Congress gives us those two or sits on them. I mean the inventors and scientific men of the country and what not, they would work for the thing to be actually completed—they would say "Here is a lead."

Mr. VENABLE. As an investment with the idea of getting fighting power, you think the money invested in airplane carriers would give us a greater dividend in fighting power than the same amount of money invested in battleships?

Admiral FISKE. Oh, far greater.

Mr. VENABLE. And that is true, as I understand you, both from the standpoint of the inherent fighting power of the machine and also from the standpoint of the needs of the present Navy?

Admiral FISKE. Yes.

Mr. VENABLE. As composed of different fighting units?

Admiral FISKE. Exactly.

Mr. HICKS. I suppose if you could have the outlining of the 1916 program, assuming no contracts had been let, instead of 10 battleships and 6 battle cruisers you would alter that by providing 8 battleships, 2 carriers, and 6 cruisers? If the 1916 program had not been started at all and we were going to start afresh to-morrow, what would be your suggestion for that program?

Admiral FISKE. My suggestion would be that far the major effort be put into airplane-carriers.

Mr. HICKS. At the expense of the battleship, but not the battle cruiser?

Admiral FISKE. Yes; if nothing had been done.

Mr. BRITTEN. How many would you have, then: four?

Admiral FISKE. I would really have to get hold of the figures to answer that.

Mr. HICKS. There were 10 battleships and 6 battle cruisers, besides a lot of smaller vessels. How would you change that ratio?

Admiral FISKE. Supposing it was entirely de novo?

Mr. HICKS. Yes.

Admiral FISKE. I would put 10 battleships into 10 airplane carriers. ✓

Mr. HICKS. Put the whole of the battleships into airplane carriers?

Admiral FISKE. Yes.

Mr. HICKS. And still keep the six battle cruisers?

Admiral FISKE. Yes. That is on the supposition nothing had been done on the battleships.

Mr. HICKS. That is starting fresh to-morrow on the program?

Admiral FISKE. Yes.

Mr. HICKS. Of course, they would have to be of high speed. They could not be of the speed of the battleships now designed?

Admiral FISKE. Oh, yes; they would be regularly designed airplane carriers. I think some of you gentlemen will remember in March, 1916, and way back in the summer of 1914, I pointed out aeronautics as being the principal thing to go in for then. So I would like to say I am consistent, anyway. ✓

Mr. BRITTEN. And at that time you recommended two airplane carriers?

Admiral FISKE. I have forgotten that part.

Mr. BRITTEN. Yes, you did, and Capt. Bristol came before the committee and desired two, and I think the cost was to be \$16,000,000. ✓

Admiral FISKE. \$17,000,000. Of course, I would not like to state exactly, because my memory may be wrong.

Mr. OLIVER. What was the speed of the carrier to be at that time, do you remember?

Admiral FISKE. Oh, yes, in general terms.

Mr. BRITTEN. No plans had been made?

Admiral FISKE. I just pointed out in general terms that here was an absolutely new thing and we had better get in right off.

Mr. AYRES. Do you think we need 10 airplane-carrier ships?

Admiral FISKE. If we need 10 anything, I think 10 airplane-carrier ships would perform greater naval service than 10 anything else.

Mr. AYRES. That would enable you to carry about 800 planes would it not?

Admiral FISKE. Yes, according to that schedule.

Mr. OLIVER. What is the speed you have in mind of a torpedo-carrying airplane?

Admiral FISKE. As much as you can get.

Mr. OLIVER. About what?

Admiral FISKE. I would not like to say that. That is a question of engineering; that is a question a man has to sit down with pencil and paper and figure out.

Mr. OLIVER. You, of course, would be at a disadvantage as compared with the speed of smaller craft?

Admiral FISKE. Oh, yes; you can not get it as fast as the smaller craft.

Mr. OLIVER. And you would have to have combat planes to give protection to them when you seek to utilize them; that is, when meeting a fleet with airplanes?

Admiral FISKE. Yes.

Mr. OLIVER. It would be a very vulnerable point of attack, just like the heavy plane would be from the combat plane.

Admiral FISKE. Oh, very.

Mr. PADGETT. Speaking of the recommendations for airplane carriers: Several years back, to refresh your memory, was not the recommendation then and the idea then that they would have an airplane carrier with a speed of 16 or 18 knots, to go along with the steaming of the fleet and to accompany the fleet?

Admiral FISKE. Quite likely; I do not remember.

Mr. PADGETT. And if such a carrier as that had been authorized, then would it not be useless now?

Admiral FISKE. Oh, no. If a thing of that kind had been commenced, the one now would be a little faster.

Mr. PADGETT. What practical use would 16 knots be now when you are going to get up to 33 or 34 knots?

Admiral FISKE. It would not be as good as the other.

Mr. PADGETT. It would be antiquated by the time you had gotten it completed.

Admiral FISKE. Of course, that thing applies to every construction you put out; it is nearly always a little antiquated.

Mr. PADGETT. I am looking back now in view of what has happened since, and by the time you got it completed, it would have been antiquated.

Admiral FISKE. Quite likely.

Mr. BRITTEN. Have you anything further to say about the building program? While I realize you have made very clear your desire and the necessity for aviation in the Navy, have you anything to say about the building program?

Admiral FISKE. No; I think the General Board and the rest are much more competent to pass upon that than I am. Admiral Sims just suggests one thing that I would like to insist on, and that would be that this development in the matériel should go hand in hand with development in the personnel, because every workman is a product of what he can do with perfect training multiplied by whatever degree of skill you have. This is not so much new workmen as it is absolutely a new kind of warfare and it is going to take some little time and the time it takes is inversely proportional to the energy we expend on it. And there is no way I can think of by which we will get an efficient Air Service over the sea except by means of the Navy. It is a naval aeronautical problem. Aeronautics over the sea is entirely a different thing than aeronautics over the land in the kind of skill required, the kind of knowledge used, and the kind of weapons used.

UNITED AIR SERVICE.

Mr. HICKS. Do you favor a united air service or a separate service for the Army and Navy?

Admiral FISKE. I can not conceive at the minute of anything which is better calculated to wreck the defense of this country than the united Air Service. I think that would be absolutely fatal. You might as well go home and say—well, whatever you want to say—I think it would be rather profane with many of us. I think it would be absolutely fatal to anything like naval efficiency.

Mr. HICKS. You do not think the British method, then, has been a success?

Admiral FISKE. I understand it has been the reverse of a success from the standpoint of the Navy. From the standpoint of certain individuals, I understand it has been extremely successful to the individuals, but from the standpoint of being anything like a success to England, it has been very, very unfortunate.

BUREAU OF AERONAUTICS IN NAVY DEPARTMENT.

Mr. HICKS. I understand you approve of a bureau of aeronautics in the Navy Department as a step in the right direction.

Admiral FISKE. If you can get that established to-morrow it will be very much better than getting it established the next day; the quicker the better. It is absolutely essential; you can not do anything toward development of scientific naval aeronautics unless you have it. It has got to be done and it has got to be done quick.

Mr. HICKS. I am glad to hear you say that for some of us feel the same way.

AIRPLANE CARRIERS.

Mr. OLIVER. As I understand, you and the General Board are in agreement as to the supreme importance at this time of Congress appropriating for at least two airplane-carrying ships?

Admiral FISKE. I am in agreement with the General Board but I go a little further than they do. I am much more impressed, I think, than most of them are with the importance of it.

Mr. OLIVER. Of course nothing can be done until Congress appropriates the money.

Admiral FISKE. Nothing can be done.

Mr. OLIVER. And it is your judgment that with the Navy we now have and the Navy now building it is of supreme importance, to make that an effective navy, to add as quickly as possible two modern airplane-carrying ships?

Admiral FISKE. It is absolutely necessary.

Mr. OLIVER. In other words, if we continue our building program, without providing for aero-carrying ships, we will have a Navy that could not be used in the event of war?

Admiral FISKE. Yes, sir, and I would like to modify to this extent what you say. I think instead of saying it could not be used, I should say we would have to use it but we would get licked.

Mr. OLIVER. It could not effectively be used?

Admiral FISKE. Yes.

Mr. OLIVER. You could not for a moment think of sending out capital ships against the navy of your enemy where they were provided with aircraft and with aircraft-carrying ships used in connection therewith?

Admiral FISKE. We would have to do it if we did not have the airplanes, though; but we would go out just the same as Cervera went out of Santiago Harbor.

Mr. OLIVER. The result would be inevitable?

Admiral FISKE. Absolutely inevitable.

Mr. OLIVER. And there could be no hope of success?

Admiral FISKE. No hope of success.

Mr. OLIVER. So that if there be one question of supreme importance at this time for Congress to consider in connection with the Navy, it is an adequate appropriation for aviation?

Admiral FISKE. Yes, sir.

Mr. OLIVER. This matter, as you recall, has been pressed by the General Board for at least a year?

Admiral FISKE. Yes, sir.

Mr. OLIVER. In other words, there seems to have been no disagreement between the General Board and others in the Navy as to its supreme importance.

Admiral FISKE. No.

The CHAIRMAN. I notice in the table that has been handed up here to us that Japan has no aircraft carrier.

Admiral FISKE. I understand she is building one.

The CHAIRMAN. Japan has no aircraft carrier according to this table.

Admiral FISKE. I understand she is building one. Our information is she is building one.

The CHAIRMAN. I have not learned of that.

Statement of BRIG. GEN. WM. MITCHELL, Assistant Chief of the Air Service, United States Army.

EXPERIMENTS IN AIR BOMBING; BOMBING OF THE U. S. S. "INDIANA."

The CHAIRMAN. Gen. Mitchell, will you tell me where you got the information from which you made this map?

Gen. MITCHELL. We got it from the officers who were sent down to observe the tests, upon request of the Secretary of the Navy—one General Staff officer, two Air Service officers, and one Coast Artillery officer. Each one of these bombs were reported where it fell by the officers who were there to observe it. The tests were carried out, beginning on the 28th of October and ending on the 3d of November.

The CHAIRMAN. You did not push a door open to get this?

Gen. MITCHELL. No, sir. It is our business to know about those things, and to get a true estimate of what they are worth. Furthermore, two photographs—one of the bombs exploding on the Indiana and another of the effect—were published in the London Illustrated News of December 11, 1920.

The CHAIRMAN. Is it a fact that the Indiana was struck eight times?

Gen. MITCHELL. Yes, sir; there were a number of direct hits on it, Mr. Butler, and other hits within the area which would be dangerous

for that small ship—about 30 per cent total in the danger area. Each shot is shown on the diagram.

Mr. HICKS. From what height were the bombs dropped?

Gen. MITCHELL. They bombed it at 4,000 feet, but I would like to call attention to this fact—that the test was not carried out by a bombardment organization. It was carried out with nothing but a flying boat and a crew with practically no instruction in bombing, with very rudimentary sights, and with bombs that had their tails cut off and did not fall properly. Under the conditions, the crew of the boat did very well, as they made a much greater per cent of hits than a cannon could at 20,000 yards.

Mr. HICKS. General, this was a case where a vessel was anchored, and on land there were trees and objects which would catch the eye of the operator of the plane to some extent, and possibly assist him in securing the range. How much difference would there be between the case of a vessel anchored as the *Indiana* was, with objects around, and a vessel out at sea where there were no objects for the aviator to gauge his eye on?

Gen. MITCHELL. It would be very much easier to hit the vessel at sea. We do not use trees with reference to the point we want to hit; we only use the speed of the plane, the direction, and our height from the object we are firing at, and then set the sights on it. It is easy to hit a vessel at sea, because it is not hidden by trees, earth, buildings, or camouflage. Furthermore, war vessels spend a great deal of time in port anchored, and therefore present the same target.

Mr. BRITTEN. Irrespective of how she may zigzag?

Gen. MITCHELL. It does not make very much difference, because we employ a massed attack. A ship on the surface of the water in motion is much easier to hit than an object at rest, because the relative speed between the airplane and the object being fired at is the thing that makes it difficult to secure hits. If a water vessel could be moving at the same rate as an airplane, there would be absolutely no trouble whatever about hitting it, because all you would have to do would be to get over the object and drop the bomb, and, as both the airplane and its target would be going at the same speed, you would be certain to get a hit. Therefore the faster that a water vessel goes the easier it is to hit from the air. This is not understood at all by people unfamiliar with bombing. As to turning the zig-zagging, the turns of surface vessels of any kind are so slow as to be almost negligible from the air.

Mr. BRITTEN. Of course, the *Indiana* was on the surface of the water.

Gen. MITCHELL. Will you allow me to explain to you our methods, what the air force is, and what the different branches in the air are?

The CHAIRMAN. We are here for the purpose of listening to you.

DEVELOPMENT OF AVIATION IN WORLD WAR.

Gen. MITCHELL. To begin with, the European war was the first one in which people went into the air to fight. To make a long story short, about the development of aviation, first, it began as an auxiliary to armies on the ground, performing the function of observation, and by observation we mean reconnaissance—finding out what is in front of an army and reporting it back.

Its next function was in adjusting and controlling the fire of the artillery, embracing weapons such as cannon, machine guns, and in some cases mortars, and things of that kind; and in the third place observation aviation was used to keep connection between the troops that were on the ground after their means of communication, such as telephone, radio, and signals, had failed, due to the fire of the enemy.

By the spring of 1915, observation aviation had become so important and had such a decided effect on military operations that it was determined that it was absolutely necessary for one side to shoot the reconnaissance planes of the other side out of the air or great harm would result. So that armament was put on airplanes for the purpose of shooting reconnaissance airplanes out of the air. Before that, pistols and hand rifles only had been used.

Organized fighting of airplane against airplane started in 1915, and immediately the mission of aviation became to destroy the opposing aviation so that you could get control of the air, as distinguished from reconnaissance which had been distinctly and peculiarly an adjunct of the troops on the ground. Its principal mission, therefore, became an air matter tactically instead of a ground matter.

The offensive mission grew and, as the conception of offensive aviation developed—that is, defeating the enemy's air force—and as the airplane developed and the motors became stronger, their capabilities of lifting weights became greater, their maneuverability became better, and their radius of action became more extended. Explosive projectiles began to be used on them for day bombing. They began with projectiles weighing about 15 or 20 pounds. They first began with little grenades and darts; they finally ended by using projectiles weighing as much as a ton.

So then we began with two branches of aviation—observation and pursuit aviation. Pursuit was really the branch designed to oppose the enemy's aviation, and was made up of the fastest ships, the most maneuverable ships, and the most thoroughly armed ships. The question of attack in the air is a question of three dimensions. It is not on the same plane, such as is the case on the earth or water, but it is a question of three dimensions, and our organization for that purpose has been worked out on the field of battle. We have come to this definite conclusion about our air tactical organization just as we have come to the conclusion as to what the organization of infantry should be, and what its armament, transportation, and training should be. Our unit for clearing the air—or pursuit aviation, as we call it—is the group of 100 airplanes divided into four squadrons of three flights each. We find that the greatest number that can be handled by an individual in the air, personally, is from five to eight ships. We call this a flight.

We put 3 flights, or 25 ships, in each squadron. There are four squadrons in a group. We organize two or more groups into wings two or more wings into brigades, and two or more brigades into divisions. Bombardment aviation is organized in a similar manner, but operates according to its own principles.

MR. BRITTEN. How many actual groups did you have over there in active operation on the day of the armistice?

Gen. MITCHELL. About 1,200 ships. I had a few more in the Battle of St. Mihiel. I had about 1,500 ships, on account of having more French ships assigned to me at that time.

Mr. BRITTEN. What percentage were American ships?

Gen. MITCHELL. About half—that is to say, there were ships of each kind used on the front. All of our pursuit aviation was French—that is, French equipment—nearly all of our observation, and a large proportion of our bombardment.

What I desire to point out now is the tactical use of aviation in the air. It makes no difference, when you are fighting in the air, whether it is over the water or over the land; the principles that govern fighting in the air are the same. The air is just the same anywhere, as far as the battles of aircraft are concerned.

The third class of aviation that developed at the close of the war was what we denominate attack aviation. We use that name in lieu of any other name. The Germans called it battle aviation. It was developed to attack ground troops, trains, motor convoys, or anything whatever which exists on the ground, to attack it with gunfire, machine-gun fire, and cannon fire at very low altitudes—that is, at an altitude of 100 feet or so. We had to use our pursuit ships for that purpose in the Argonne battle on account of the fact that we had no attack equipment.

So, at the end of the war, for our offensive use against the enemy's aviation, his lines of communication, and his formations on the ground that were within the range of the fuel capacity of our airplanes, we had three distinct kinds of aviation—first, pursuit aviation; second, bombardment aviation; and third, attack aviation.

These branches of aviation are mutually interdependent—very much as Infantry and Artillery are on the ground. Bombardment aviation can not act in the face of an opposing enemy force without the support of pursuit aviation. Pursuit aviation, however, can not closely accompany bombardment, because its fighting power depends on maneuver, and when an action occurs they immediately become separated from the bombardment. We have to organize our attacks so that at the point of greatest danger—that is, where the enemy can bring his maximum attack—our bombardment and pursuit planes come together on convergent lines. In the same way, our attack aviation, if we do not protect it by pursuit aviation, is going to be shot out of the air by the hostile pursuit aviation, because of its power of greater maneuverability. If you have such maneuverability, and particularly if you have it in three dimensions, so as to be able to put yourself in a position where the enemy can not hurt you, you have got him.

The greatest concentration of aviation always took place wherever the maximum fighting was going on. Bombardment aviation asserted its power more and more because, with the armies in intimate contact, very much the same as they were in Virginia in 1864, they were so close to each other that their communications were right behind them, and you did not have to have a very great airplane fuel capacity to cover many important centers. Vast reserves of men and material were concentrated around the armies. However, toward the end it became an established principle that you could always whip the enemy's front line if you had the initiative. But when he brought

up his reserve for counter measures it was different. If, therefore, you could get at his reserves and keep them out of the fight, far-reaching results could be obtained. The German attack of the 21st of March was a very good example of this. They broke right through the British Fifth Army, destroyed the reserves, and opened a great hole in the line. I was present the following day and saw it.

So, bombardment aviation was being developed to employ the largest high-explosive projectiles, to demolish enemy centers of concentration, to prevent the transporting of supplies, and to obstruct movements by road and rail. These were the reasons for the bombardment attack on Paris by the Germans in the summer of 1918, and it had a great deal of effect. It congested the means of transportation around Paris to a great extent, and prevented and delayed the shipping of supplies.

The third class of aviation that came into use during the war, particularly toward the end, was what we called attack aviation. This was designed to attack moving troops, trains, convoys of automobiles and trucks, tanks, artillery, and even infantry deployed. It flew at very low altitudes (one or two hundred feet), and took advantage of concealment offered by forests, hills, streams, smoke, or anything of that kind. The Germans had the upper surfaces of their planes so painted that it was very difficult to see them over 1,000 feet, and, toward the end of the war, the Germans had armored attack planes on the front. They were not used, however, to any great extent, as their attack aviation was just ready when the armistice came. These used machine gun fire and small bombs. Our present attack aviation utilizes cannon, machine guns, and small bombs—both explosive and with gas—which not only will be very effective against military objects such as are mentioned above, and also against shipping of all sorts, for neutralizing antiaircraft fire, and covering the main attack of the bombardment airplanes, but also in the actual destruction of unarmored ships, and particularly in resisting landings from vessels where both cannon fire, machine-gun fire, explosive bombs, and gas bombs may be used with great effect.

This was the state of aviation at the end of the war. Its first mission was to destroy the hostile air force; next, to attack ground troops and strategical centers, and to directly help the ground troops in their own work.

The end of the war, of course, saw the national-defense problem of each nation changed from one which sought an important decision in the northern part of France to the larger question of national defense in a future war. Certainly something had been learned from the war, and aviation was the new element. Each nation has its own problem to solve, and in considering how they should balance their forces between the older services, such as the navy and the army, they have had to consider the possibilities of this new service in the air. The consideration of the question in Europe is quite different than is the case with us, both on account of the proximity of the nations to each other and also their means for developing air forces and their climate. We must consider that the people who come against us in the future are either coming through the air, or on the water, or under the water. That is the problem we have to solve.

GERMAN DIRIGIBLE DESIGNED TO ATTACK NEW YORK.

The development of aircraft has been so rapid during the war, and has been so rapid since then, that a great many considerations can be taken into account now which were not possible during the war. For instance, at the time of the armistice, the Germans had an airship that would go around the world at about the latitude of New York—that is, the *L-72*—which the French have now at Marseille. We can keep an airship in the air for several days.

Mr. PADGETT. Is that a heavier or lighter than air ship?

Gen. MITCHELL. A lighter-than-air ship. She was a ship really designed for an attack on New York.

Mr. PADGETT. Of the dirigible type?

Gen. MITCHELL. Yes, sir; a rigid airship of the Zeppelin type.

Mr. BRITTEN. Why do you say she was originally designed for an attack on New York?

Gen. MITCHELL. That is the information we get from the Germans. She can carry about 20 tons of explosives.

Mr. BRITTEN. Whom did we get it from?

Gen. MITCHELL. From their officers in Germany. Col. Hensley brought it back, specifically. She is perfectly capable of doing it. There was nothing here that would stop her; nor is there anything here now that would stop her.

Mr. BRITTEN. Would not a heavier-than-air plane stop her?

Gen. MITCHELL. No, sir.

Mr. BRITTEN. Why not?

Gen. MITCHELL. Because she is designed to travel up at a 30,000-foot altitude.

Mr. PADGETT. How would they keep the men alive?

Gen. MITCHELL. By clothing electrically heated, by oxygen, and food.

Mr. OLIVER. Do you know whether they have ever flown at those heights?

Gen. MITCHELL. We have had men up over 30,000 feet in heavier-than-air craft, and I can tell you that we are designing ships for that purpose, and they will be flown this year, I hope.

Mr. PADGETT. There have been freak men who have gone up to those heights, but the occasions have been sporadic, have they not?

Gen. MITCHELL. It is not sporadic; it is worked out with a definite problem in view; that is, for getting greater speeds, which is possible in the rarefied atmosphere.

Mr. PADGETT. After a man gets up there and stays a little while he becomes very cold, does he not?

Gen. MITCHELL. Not if he is heated up, any more than you will in a house in the wintertime if you have a fire.

DEVELOPMENT IN AVIATION AS RESULT OF WORLD WAR.

To get back to the subject—I was speaking of airships as a means of reconnaissance. Our first problem in this country is to determine where a hostile air force is coming from or a hostile navy. You can get more reconnaissance data from an organization of airships for that purpose than from anything else. In other words, take the

Atlantic area, or the corresponding area on the Pacific, and figure out how long it will take you to patrol from one place to another, and then divide the area into patrol districts, and that will govern the number of airships you have to have for that purpose. The Germans did that over the North Sea during the war. That was one application of the air force over the water which was used during the war. Now, you will come to the conclusion that, in case of trouble of that sort, you will need constantly on duty 10 ships in the Atlantic. They will cover a front of about 2,000 miles altogether.

In order to relieve them, you will need 10 more; so, your airship organization in this territory will be 20 ships. I believe those 20 ships can be maintained in peace times on an economical basis by getting people to build them, and will cost the Government almost nothing except for the establishment of some airship stations, and will be very profitable commercially. They could be used instantly in case of war. In fact, a company is being organized now in New York with a view to starting that in this country.

Mr. OLIVER. In that connection, if it will not disturb you, would you advise that the Government offer some inducements to this private company?

AIRSHIP STATIONS.

Gen. MITCHELL. I am a taxpayer, but I would gladly pay my money out to establish airship stations for these organizations to use, provided they made their ships available to us in time of war. We should have 12 stations. They would cost, on an average, \$10,000,000 each, as distinguished from the railroad terminal right here that cost \$30,000,000, about \$200,000,000 for the station in New York, and \$60,000,000 for a railroad station in Chicago. It would be a good investment. We could have these people pay in money later, or something of that sort, and they will be willing to do it after the service is started.

As to the possibility of the destruction of those ships by airplanes, it is very remote, because they have the ability to travel very high-ceiling, as we call it. You see, if you have an airship, for instance, that is up in the air, going along at an altitude of 30,000 feet, or, we will say, 20,000 feet, because we have not a pursuit plane to-day that will go up 30,000 feet—it takes 20 minutes to go up 20,000 feet in an airplane, and an airship will travel 20 miles or more in that time. It would be completely lost to view, unless you have airplane patrols, covering a whole area, on duty signaling back and forth. If an airship takes advantage of climatic conditions, darkness, clouds, sun, rain, and everything, it is very difficult to find it. We had great difficulty on the western front in Europe finding them in the air. I will tell you how they were kept away from London after awhile, if you want to know.

So, we must insure, first, an airship organization for reconnaissance purposes; next, you must insure control of the air, over your navy on the high seas, in order to allow them to use their missile-throwing weapons properly. If you do not do that, they can not use their missile-throwing weapons as well as the force that has a good air service.

AIRPLANE WEAPONS AND PROJECTILES.

So far we can regulate or adjust, as we call it, the fire of missile-throwing weapons very satisfactorily up to about 20,000 yards, or a little bit less than 20,000 yards. Beyond that, the adjustment becomes extremely difficult. At 40,000 yards, to-day, we do not believe more than 1 per cent of hits can be made by any cannon on the ordinary target that we have, and, if the life of the gun is not over 200 rounds, you will never hit anything but twice with that gun. Therefore, we believe that, for targets which are exposed to airplane attack, at a distance of over 20,000 yards, you will get more for your money if you attack them with airplanes than anything else.

The third application of air power is from land stations against other air forces and shipping.

The Army Air Service is charged with the attack of objects on the ground, as well as the attack of objects in the water. On the ground, we have three methods of attack. One is the gas bomb. Gas bombs were not used in Europe, because, if one side had started it, the other side would have started it, and the loss of life among the women and children in the back areas would have been terrific. However, that is contemplated as a possible use of the airplane in the future, and we find by studies with the Chemical Warfare branch that we can use certain amounts of certain gases for covering areas, and that the gas will continue to be effective for a period of time. If we want to cover an area 10 by 10 miles, such as New York is—New York is a very easy target—we may use about 2 tons of crying gas once in every eight days. If you want to use mustard gas, you would use about 70 tons once in every eight days; if you want to use phosgene gas, 200 tons. This, of course, is very deadly.

GAS BOMBS AND DEATH DEALING LIQUIDS.

The following statement by Mr. Bradner, chief of research of the Chemical Warfare Service, is very interesting:

STATEMENT OF D. B. BRADNER, CHIEF CHEMICAL RESEARCH AND DEVELOPMENT DIVISION, CHEMICAL WARFARE SERVICE.

Mr. BRADNER. Mr. Chairman, the Chemical Warfare Service has discovered a liquid approximately three drops of which, when applied to any part of the skin, will cause a man's death. Much smaller amounts than this, or even vapors from the liquid, cause very severe slow-healing burns.

The experience of the World War proved it is possible for an airplane to fly within 100 feet of the enemy troops and machine-gun them with practical impunity. The opinion of men well informed on aerial warfare is that the only defense against airplanes is attack by airplanes.

If, instead of carrying machine guns, attacking planes were equipped to carry a tank of this liquid for discharge from nozzles similar to the ordinary street sprinkler, so that it would fall like rain, killing everything in its path, then you would have a weapon which would absolutely destroy troops, noncombatants, or cities, unless they were protected by a superior air navy.

One plane carrying 2 tons of the liquid could cover an area 100 feet wide by 7 miles long in one trip and could deposit enough material to kill every man in that area by action on his skin. If the men were not protected by gas masks, which would be the case if the attack were made on a city, the fatal area would be several times as great.

It is well to mention here that it is not only possible, but highly probable, that an enemy, if he had control of the air and so was free from the fear of retaliation, would threaten to use this weapon to compel the evacuation of cities, munition works,

etc., and, if such evacuation did not take place, the position would undoubtedly be attacked.

The only limit to the quantity of this liquid which could be made is the amount of available electric power, as nearly every nation has practically an unlimited supply of the necessary raw materials. It would be entirely possible for this country to manufacture several thousand tons per day, provided the necessary plants had been built.

There is a possibility that a protective clothing can be developed which will entirely cover the wearer and be impervious to this liquid, still allowing water vapor to pass through. Work along this line is being pushed by this service, but the problem is an extremely difficult one and it is probable that several years will be required to develop such a material, if it is possible to do so at all.

It is probable that cities can be protected by chemical means, but this, also, will require time for development.

The most logical defense is an air force more powerful than that possessed by any other power. At the present time, if our country were attacked by an enemy with a superior air force, our entire Army would be annihilated, for it could do nothing whatever to defend itself.

During the Argonne offensive in the past war the entire first American Army of a million and a quarter men occupied an area approximately 40 kilometers long by 20 kilometers wide. If Germany had had 4,000 tons of this material and 300 or 400 planes equipped in this way for its distribution, the entire first army would have been annihilated in 10 to 12 hours.

In closing, it is desired to emphasize the importance of scientific research, as compared with a large army, as the more effective and less expensive means of protecting our country. The Chemical Warfare Service this year is asking for less than 1 per cent of the total Army appropriation. During the past war gas produced over 30 per cent of our casualties; in the future, the percentage will be far higher. New methods of defense will be devised to meet this particular new development; but if scientific research on military problems is not on an efficient basis, another development will be made and an enemy will use it against us before we have worked out a defense.

We have contemplated the use of gas in the attack on warships, but, although we have had no tests of that yet, we think we can do more with explosive bombs. However, everyone on a battleship will have to wear gas masks, and otherwise protect themselves against the fire and gas of explosive bombs. We think we can do more with explosive bombs than any other weapon against the warship, at present. I will tell you why. The characteristic of bombs, as distinguished from other projectiles, is that they carry half of their weight or more in explosives. For instance, an armor-piercing projectile carries only a very small proportion of its weight in explosives. A ton projectile has only about 50 pounds of explosive in it, or 2½ per cent. A ton airplane bomb has from 1,000 to 1,400 pounds of high explosives. In this war it was proved that the weight of the explosive, with a high order of detonation of the explosive, is the thing that made the trouble, as distinguished from any projectile which pierced and merely fragmented. Not only did we get effects that we knew nothing about before, in blast, gas effect, and actual heat from fusion, but general destruction from vibration that we never dreamed of before at all. Now, in an attack against an object on the land—against buildings like this—the bombs tear the structure to pieces, both by piercing and exploding. Against things encased in steel, like a warship, very interesting effects are produced.

We estimate from the studies we have so far made that direct hits on decks and superstructures will break every electric-light globe on the ship, throwing her into absolute darkness below decks; disrupt telephone, radio, and interior communication systems; fill firerooms, engine rooms, and all compartments ventilated by a forced-draft system with noxious gases; cause shell shock to the persons within

a radius of 300 feet, disrupt ammunition hoists, dislodge or jam turrets, dish upper decks at least, kill all persons on upper decks (anti-aircraft gun's crews and fire control parties in tops), cause fires to break out, and explode all anti-aircraft ammunition. Detonation of bombs beneath water line will sink or disable battleships. If explosion occurs forward of bulge (that part of the ship fitted with longitudinal protection bulkheads), it will cause her to settle by the bow, causing her to decrease speed, to steer badly, and consequently to fall out of formation. If explosion occurs aft of bulge, the after compartments will fill, causing ship to settle by the stern; the main propeller shafts will be thrown out of line, causing almost immediate stopping of engines on that side of ship, consequent slowing down, and inability to keep station in formation. In addition, there is a strong probability that the rudder will become jammed at the same time, making the ship a menace to the ship behind her.

If an explosion occurs abreast of the bulge (or amidships) and does not cause the ship to sink, it will at least cause the ship to take a sharp list, causing difficulties in steering and consequently serious trouble in keeping position in formation. It will also cause a marked change (increase or decrease) in the angle of elevation of the main battery guns, which will greatly decrease accuracy of gunfire.

RESULT OF BOMB EXPLODED ON "INDIANA."

To quote from a report of an eyewitness of the destruction of a large bomb exploded on the *Indiana*:

It is safe to assume, judging from the results obtained with the 1,650-pound demolition bomb containing 900 pounds of amatol exploded on the deck, that this amount of explosive is sufficient to put a modern battleship out of action.

It is safe to assume that the flame and gases generated by the explosion would instantly kill all those that were reached by them. This would include all personnel in the masts, all personnel in the vicinity of the bomb, the personnel in the turrets, provided one of the openings was directed toward the explosion; lastly, and of major importance, all personnel in the engine room, since the gases would readily penetrate through the gratings over the engine room. It is safe to assume that any personnel in the turrets in the immediate vicinity of the explosion would be killed by concussion. The damage to the navigating instruments and communications would certainly be considerable.

The CHAIRMAN. You spoke as though you had made the tests.

Gen. MITCHELL. Only up to a certain point, and, from that, we make an estimate of what is possible. I will show you why we judge it, from photographs I have.

The explosive bomb is the second class of weapon we have. Its size and weight are dependent on the size of the airplane that is designed to carry it. The biggest airplane now under construction is designed to lift about 5,000 pounds in addition to fuel. Our present service bomber will lift from 1,800 pounds to a ton, with its full gas capacity of five and a half hours.

The third class of weapon we have is the gun. We have so far tried in this country the 30-caliber machine gun, the 45-caliber, the 11-millimeter that we had in Europe, the 50-caliber gun, the 39-millimeter cannon, and the 2.95-inch howitzer.

Mr. BRITTEN. How did you take care of the recoil?

Gen. MITCHELL. It was very interesting. Many thought that there would be a great deal of recoil, and that, when they fired it,

it would make a fuss, but, when they fired it in the air, they did not feel it.

The CHAIRMAN. You say that you carry the 6-inch guns?

Gen. MITCHELL. We have not yet done so, but I believe it is perfectly practicable. We will have to have that in fixed position. We will have to aim the ship in order to shoot that in the way that we do with the machine guns on a pursuit ship at present.

Mr. HICKS. What has become of the gun they were working on during the war, a scheme of counteracting a charge going one way by having another charge going the other way?

Gen. MITCHELL. That was used to some extent, but not very much for the reason that, in shooting backward, it was apt to hit your structure. We are going to try that kind of a gun on a fixed mount under the plane, parallel with the axis of the ship, so that the back-fire will have no bad effect.

Mr. HICKS. But you do not think this kind of a principle is necessary.

Gen. MITCHELL. I do not think it is, but we may be able to carry a bigger gun with this equipment than otherwise. We are developing a larger gun for attacks on specific things, such as tanks or unarmored naval ships, such as torpedo-boat destroyers or things of that kind, which, of course, they will pierce.

Mr. PADGETT. Do you put the gun under the ship?

Gen. MITCHELL. We propose doing so at first.

Mr. PADGETT. After you fire it, how are you going to reload it?

Gen. MITCHELL. Through the bottom of the ship. That would be an easy matter. But we have fired the 3-inch gun successfully; we know that positively.

The point I want to make about aviation is this—that in the development of the air force, it must be remembered that the mission of an air force is primarily to destroy the aviation of an opposing force, and, after you have assured command of the air to a sufficient extent, then to bring a direct attack against the enemy in a way that he will feel it the most. In directing that attack, it may be necessary to hit his centers at a great distance. That is to say, if an enemy were attacking us and wished to destroy us, he most certainly would hit our centers, if he were capable of doing it, in the Middle States, and all the way along our principal lines of communication. Our vulnerable area in this country is in a sort of "T" shape, from Boston to Chesapeake Bay, and from New York to Chicago. If communication in that area were interrupted by airplane attack, it would be very serious, on account of the industries, the population, the agriculture, and the production, etc., that are in that area.

Mr. BRITTEN. Between New York and Chicago there are various routes, however.

Gen. MITCHELL. They are attacked wherever they come together. We always make a study of the lines of communication, and we take, Mr. Britten, the most important ones and keep after them successively in order of importance.

AIRPLANE ATTACK AGAINST SEA CRAFT.

Of course, you gentlemen are interested in the attack of objects over the water, and the relative value of these various instruments of warfare that modern science calls upon us to develop.

Now, the problem of the attack of vessels on the water, I regard in two ways—one, the attack of unarmored ships, and, second, the attack of armored ships. We can attack them in two ways—either by hitting them directly, or exploding missiles in the water near them. Some of us have felt that one was more effective than the other, and others the contrary. I, myself, have thought that we would get much more out of a mining effect than we would out of direct hits. However, we do not yet know.

Mr. HICKS. Take, for instance, a 500-pound bomb.

Gen. MITCHELL. What do you mean, a total weight of 500 pounds?

Mr. HICKS. No; 500 pounds of explosives.

Gen. MITCHELL. That is a 1,000-pound bomb.

Mr. HICKS. How close do you think you would have to come to a battleship of the modern type to seriously injure the ship?

Gen. MITCHELL. I think that 60 feet would do the business.

Mr. HICKS. What would it do?

Gen. MITCHELL. If it explodes near the stern, it will bend the rudder, it will bend the propeller, and will break the plates to such an extent that the ship will begin to leak badly. With the newer ships, we have not had an opportunity to make a test, but a little bomb just about the size of the bomb in the back part of the room, which contained 214 pounds of T. N. T., was put about 30 feet below the surface, and about 25 feet away from the stern of the *Indiana*, and, in that case, was sufficient. That was the bomb that bent the shaft, rudder, and made her begin to sink.

Mr. HICKS. Did you investigate afterwards to find out what the charge did?

Gen. MITCHELL. The report on that was that it bent the rudder post, broke the plates, and bent the propeller shaft. That ship would have had to get out of line, and she would have been an easy object of attack.

So we have tried to get targets of actual ships to develop our armament and methods of attack, which so far have not received the consideration they deserve, and for that reason we watched the experiments on the *Indiana* with the greatest interest and care.

Now, we have had a great deal of experience in bombardment from the air over land on the western front, when we had every instrument of antiaircraft fire brought against us that was known to the civilized world. Not only was every instrument of antiaircraft brought against us but that was on land where these things could be concealed, where they could be massed in the greatest numbers, and not on the sea, where you have an absolutely unobstructed vision. We know a great deal about antiaircraft, both against us and what we used against the enemy, so we can tell you pretty well from the experience we have had in the war what it is worth and how it will have to be handled from the ship in order to have the greatest effect against us. We know that pretty definitely. We know that under the conditions that obtained not only will we have very little loss from it but we can injure it by our attack aviation at the low altitude of from 100 to 300 feet. We will come down and attack them. Next, we know, according to the size of the target, how many projectiles and at what height and with how many planes we have to attack in order to succeed.

For instance, if we want to attack this Capitol Building here, and there is opposed to us an air force which keeps us up 15,000 feet, we will attack first by a wing of about 300 planes, and we will get it every time: there will not be any question about it. If, on the other hand, you have no hostile air force and only antiaircraft guns and cannon, and we want to destroy the building, we would come down with only one flight of six ships, and come down as close as we can, and we will hit it. The proposition of an attack by bombardment aviation from the air is very similar to an attack by artillery on the ground. If you have only one gun, and want to hit, we will say, the headquarters building at Fort Myer, you may have to shoot for an hour. Maybe something will happen to your gun so that it will not work. But, if you want to smash that up instantly, you will bring a battalion of artillery out, with three batteries of four guns each, and you will get the target right away.

Mr. BRITTEN. It will depend also upon the opposition.

Gen. MITCHELL. That is the primary thing. You can not attack until you have cleared the air sufficiently with your pursuit aviation. The whole test of your strength in the air is your pursuit aviation, whether it is over the land or over the water. You have got to attack the hostile aviation. You can not get away from that.

As to the effect of these things, we have tried for a long time to throw bombs down from the air, because we know that they will have a great deal more effect than they will if they are laid on an object. I might say that the *Indiana* had 20 bombs exploded in the water around her and on her decks. There was one bomb, a picture of which I will show you here, which caused a very interesting condition to occur. It smashed her decks to pieces and cracked up 8-inch armor. This was an obsolete ship. It threw the turret off of its mounting, it smashed up the ammunition hoist, and would have put that ship completely out of action. It just gutted the ship, and another bomb caused her to sink, with only 214 pounds of T. N. T. in it. This large bomb was a 1,650-pound bomb, which had about 900 pounds of high explosive.

Now, we are not sure which are the best projectiles—whether we have to penetrate a great deal of armor, or whether it is better to attack from underneath the bottom of a battleship, or all of these things in combination. What we want is to be allowed to develop it.

Mr. BRITTEN. How much money do you want.

Gen. MITCHELL. No more than was set aside by Congress last year. No matter how much money you appropriate, if it is not spent wisely and in accordance with the mission that aircraft are to carry out, you are not going to get the maximum efficiency out of it. Furthermore, you must put it under the control of people who are interested in its development above anything else, and not give the work to people who have not had experience and training in it, and will not make a life work of it.

Mr. BRITTEN. Well, what success have you had in getting more bombs?

Gen. MITCHELL. We are going to get some more good bombs. But it takes so long to get these things done. You have to go to many different people, and ask them to do something, and then you have to go to see somebody who has never seen a bomb and does not know anything about a bomb to get authority to have it made, and you

have got to argue with him as to whether a bomb is a good thing in war or not; and he will perhaps tell you that a bomb is of no value because it did not prove a success in the Civil War. And it is the same thing all the way through; you have those things to contend with in developing anything that is new, particularly when you are attached to an organization whose main object is something besides aviation. This is not a knock at our Ordnance Department who are trying to do all they can. It is a result of the system.

Mr. BRITTEN. Are you meeting with fair success now?

Gen. MITCHELL. Not to the same extent that we could if we had these efforts united. It is very slow.

UNITED AIR SERVICE.

Mr. HICKS. I believe you are in favor of a united air service, are you not, General?

Gen. MITCHELL. Yes, sir; that is the only answer to the problem ✓

Mr. BRITTEN. You do not agree with the naval officers, then—

Gen. MITCHELL (interposing). No, sir; I do not.

Mr. BRITTEN. Let me finish my question, please. You do not agree with the opinion of the naval officers that a naval aviator, who has to go out with the fleet and who gets his orders from the commanding officer of the fleet, should necessarily train with the Navy?

Gen. MITCHELL. No, sir.

Mr. BRITTEN. You think that he might just as well have been a carrier for the Postal Service, or for commercial interests, flying up and down the coast?

Gen. MITCHELL. He should be trained in pursuit aviation, attack aviation, and bombardment aviation. In other words, our aviation requires more care in the training of its personnel than that of any other service because it is so new. The Navy is a well-understood institution. It has obtained for centuries. Now, you do need a special kind of aviation in the Navy for observation purposes; and the same is true as to the Army. In those cases they have got to specialize with the Army or the Navy. This part is no more than 20 per cent of the whole aviation, and of this not more than 20 per cent of their aviation training needs specialization.

Mr. PADGETT. In August, 1918, just a short time before the armistice, I was in England, and I visited a number of the aviation plants and fields. And I talked with a large number of army officers who were in control of aviation, and I asked them the specific question, and every single officer of the English army who was in control of aviation or had anything to do with it disapproved of a united aviation service and said it was a failure.

Gen. MITCHELL. Did you ever ask the air officers about it?

Mr. PADGETT. Yes; those were the air officers that I asked.

Gen. MITCHELL. The air service officers?

Mr. PADGETT. Yes; the men at the aviation fields and those who were flying officers at the different flying fields; and every one that I talked to (and I talked to a dozen or more) disapproved of it and said that it was best to have separate air services, the army handling theirs and the navy handling theirs.

Gen. MITCHELL. I will answer that by saying that I was with the British Air Service a great deal, and I had some of them under my command a part of the time; and I know how it came about that their united service was formed, and I also know that they never would have made the strides they have without it. Furthermore, of the hundreds of their flying officers that I have come in contact with, I can not remember any who were not sure that the united force was a good thing.

Our officers here are practically a unit in believing that it should go through, and that we will never have an adequate development of aviation until it comes about.

Mr. BRITTEN. Do you mean the General Staff of the Army?

Gen. MITCHELL. No, I mean the officers in the Air Service.

Mr. BRITTEN. What do the officers of the General Staff think about it?

Gen. MITCHELL. They are largely against it. Some favor it and more are favoring it every day as they learn more about it. All that is necessary is to have anyone really understand the Air Service, and they will come to the conclusion that a united service is the only answer. You will find officers of the older services against allowing any service to separate. They want to retain control of it. And that is very natural; that is human nature. I have been an officer 22 years, have been through our School of the Line, the Staff College, and served on the General Staff before the war. It has always been the same thing; that is, the Army knows little or nothing about aviation; their main function is to develop the Infantry division to the top notch of efficiency. It is not to develop an air force. Here are some opinions about the organization of aviation that may be interesting.

[Extract from page 5 American Aviation Mission Report.]

The American Aviation Mission therefore recommends the concentration of the air activities of the United States, military, naval, and civilian, within the direction of a single Government agency created for the purpose, coequal in importance with the Department of War, Navy, and of Commerce, to be called in this report, for the purpose of identification, the National Air Service.

[George Clemenceau, President of the Council, War Ministry, the President of France, p. 7, A. A. M. report.]

The future aviation in France will only be assured with the cooperation of all efforts and the unification of the general services. Also, it will give the advantage of better work from the personnel and credits which are actually effected to similar objects in different ministries.

[Mr. Crowell, p. 5, pt. 1, United Air Service Hearings.]

* * * After more than seven weeks spent abroad, where I was given every possible facility and opportunity to study what those countries were doing and talk with the men who had control during the war and were shaping the policies for the future, I have become convinced that the only solution of our future air policies is an air department; that only through such a department will it be possible for this country to keep abreast with the other great powers.

Among the representative men with whom the mission discussed this subject was Winston Churchill, secretary of state for war and secretary of state for air, who said that the British air ministry organization, although not perfect, is the best plan yet developed; it is founded on actual war experience. There is no possibility of England reverting to the prewar organization. I will read here a short extract from the speech of Lord Fisher, of Great Britain.

"By land and by sea the approaching aircraft development knocks out the present fleet, makes invasion practicable, cancels our country being an island, transforms the atmosphere into a battle ground of the future. There is only one thing to do to the ostriches who are spending these vast millions on what is as useful for the next war as bows and arrows. Sack the lot. As the locusts swarmed over Egypt, so will aircraft swarm in the heavens, carrying inconceivable cargoes of men and bombs, some fast and some slow. Some will act like battle cruisers and other as destroyers. All cheap and—this is the gist of it—requiring only a few men as crew."

[Mr. Crowell, p. 8, pt. 1, United Air Service Hearings.]

In France I had the honor of talking with Marshal Foch, who told me that the fact was clearly demonstrated in the present war, that if a nation is to conquer, she must have supremacy in the air.

[Mr. Crowell, p. 9, pt. 1, United Air Service Hearings.]

Field Marshal Haig, Marshal Foch, and Ludendorf agree that before the mobilization of armies can be effected in the next war, a great conflict will occur in the air. The aggressive nation will be prepared to launch an attack upon the shipping, munition, manufacturing, and storage centers, and even the cities of its opponent. Unless the opponent is ready to meet or anticipate such an attack, vital victories will be early accomplished. It is only the nation that can clear the air of enemy forces that will be able to launch a campaign with its land and naval forces. With Europe only 16 hours removed from this country by air routes, we can not rest in fancied safety of isolation. It is only through the agency of a single responsible organization that we can confidently look to preparedness for such an eventuality.

[Extract from telegram from Maj. Gen. Hay to Director of Air Service, p. 217, U. A. S. hearings before Subcommittee on Military Affairs, House of Representatives.]

So long as the building up of the Air Service, the training of large numbers of pilots, and the securing of appropriations necessary depend upon the scattered efforts of the Army, Navy, and Post Office Departments, each one having to go before Congress to obtain the necessary appropriations, we will never obtain the result as it should be.

The only way, in my opinion, in which the Air Service in this country can be developed to the maximum of its efficiency at the minimum cost will be to gather in the hands of one department all the agencies which will go to foster interests in the service, conduct experiments as to types, obtain the necessary appropriation, train large numbers of aviators, and equip the service with the necessary supplies. In other words, we must concentrate all the agencies which favor development of aeronautics and direct their efforts toward a common end. In my opinion this can never be done under the present system of scattered efforts and divided responsibility. For these reasons I am strongly in favor of the bill recently introduced in Congress to establish a department of aeronautics as a Cabinet position, which shall have charge of all matters pertaining to the purchase, manufacture, maintenance, and production of all aircraft in the United States, as well as the direction and control of all personnel necessary in connection with the Air Service.

[Telegram from Maj. Gen. Traub to Director of Air Service, p. 218, U. A. S. hearings before Subcommittee on Military Affairs, House of Representatives.]

From my experience in the past war I am absolutely convinced of the advisability of the establishment of a department of aeronautics as a Cabinet position, with the powers and under the conditions specified in said telegram. My experience with aviators has been that they are a body of men with wonderful possibilities, but they need above all strict disciplinary training as they are apt to consider themselves superior to the necessity of strict compliance with competent orders, especially in an emergency. If this point be given prime consideration, the possibilities of the new department should prove of inestimable value to the country in time of war especially.

[Telegram from Gen. Edwards to The Adjutant General of the Army, p. 218, U. A. S. hearings before Subcommittee on Military Affairs, House of Representatives.]

I have your telegram directing that I give my opinion from my experience in the past war as to the advisability of the new department to direct Air Service. I am inclined to believe that if the units of aviation as the telegram states would be assigned to the Army and Navy for training in times of peace and in war such personnel would be under the complete control of the Army and Navy, to approve the project.

[Senator New, from 66th Cong., 2d sess., p. 2290.]

Senator New. Mr. President, Great Britain at this moment maintains a separate air department, and has never deviated from that policy from the time it was adopted, along in the spring of 1918, now nearly two years ago. There have been reports, of course, to the contrary, but Great Britain has maintained a separate air department for the last two years. I very recently saw a statement made by Winston Churchill on the floor of the British Parliament, in which he said that under no circumstances would Great Britain depart from that policy. The British air attaché here, Commodore Charlton, tells me the same thing, and all of my information is in accordance with what I have just stated.

[Extract from reply received to the letter sent by Senator New to Commodore Charlton.]

SEPTEMBER 22, 1919.

"It is being constantly reiterated that the separation of the air force in England has been so little successful that in all probability the Royal Air Force will, before long, be split up again into the several services and branches."

I can assure you that there is no ground whatever for such a statement and that, on the contrary, the amalgamation has proved a decided success and that only recently, in order to mark finally the complete separation of the Royal Air Force from the navy and the army, new titles of rank have been approved by the King. Certain reorganizations are taking place, as is inevitable in an undertaking so large as the separation of service aeronautics from the other services, brought about hastily during a period of war; but these reorganizations serve only to emphasize and mark the fact of final separation, rather than a reversion to the old order of things.

Mr. BRITTEN. Would you put an Army officer in command of this combined service?

Gen. MITCHELL. No, sir; I would put an air officer in command of it.

Mr. BRITTEN. Where would you get him?

Gen. MITCHELL. You would get him from the personnel obtained by a transfer of flying officers from the Army, Navy, Marine Corps, and Coast Guard into the Air Force. The Navy has good air officers; the Army has good air officers; the Marines have good air officers. They should be combined, and the best man in the combined service should be put in command.

Mr. HICKS. Gen. Mitchell, I say this with all sincerity, that I appreciate your splendid efforts in connection with aviation. But would it not be possible to bring about a compromise on this question? Your main argument a few moments ago was lack of bombs and other matériel. Could we unite the services, so far as production and matériel are concerned, but have it organized so that the Navy would take care of its own personnel and the Army would take care of its personnel?

Gen. MITCHELL. Those things have been tried and have not proved a success. If you do not put the equipment under the control of the officers who have to use it, and let them absolutely govern what it should be, you will not get the best results. All development of equipment must be based on operations and tactical requirements.

Mr. HICKS. Your idea is that it should all be united, or it will not be a success?

Gen. MITCHELL. It should all be united or it will not be a success. And, furthermore, in aviation—whether it be over the land or over the sea—if you divide your forces and resources and have a different tactical and technical organization, as is the case at present, and different material and equipment, you will never be able to cope successfully with your enemy who concentrates it. He will get you

in detail if he comes at you with his united air force. That is absolutely a sure thing.

Mr. HICKS. Do you think that the esprit de corps on a battleship will be the same when they have an aviator on it from a united air service who is not a naval man, as it would be if he was a naval man?

Gen. MITCHELL. I should say that that would be governed by the efficiency of the air organization that was assigned. And I know that the united air service could be very much more efficient than is the case with the separate services at the present time. The esprit de corps of the flying men would be immeasurably higher and they would be more efficient.

Mr. BRITTEN. That is not saying very much.

Gen. MITCHELL. That is true. But remember that attention has been called to these things for years, and still we drag along in a way we know and have proved to be inefficient because it has not delivered the goods.

These airplane types [exhibiting photographs to committee] are those we have gotten out since we came back from Europe. They are good types; they are American types; and they are entirely the result of our studying the problems in front of us, and making our technical division study what the tactical organizations want, and develop them.

Mr. BRITTEN. Are those planes that you have shown there [indicating] as good as the foreign planes?

Gen. MITCHELL. Yes, sir; that pursuit ship [indicating] is as fast as anything there is issued as regular equipment in the world today; and it is well armed.

Mr. KETTNER. What speed has it?

Gen. MITCHELL. It flew 170 miles an hour the other day at Mincola, with Col. Hartney as pilot.

Mr. KETTNER. What will we do with all those pursuit planes that we have now?

Gen. MITCHELL. We have no modern pursuit planes with organizations. We are building some of the type I have shown.

Mr. OLIVER. How long does it take to get such planes?

Gen. MITCHELL. This is the method of developing an airplane: First, you determine what a plane is to be used for—pursuit, attack, bombardment, or observation. That determination must come from the practical flying people.

Mr. OLIVER. Perhaps I have not made myself clear. What I want to know is, when you have determined what type of plane you want, how long does it take to produce it?

Gen. MITCHELL. We turn that problem over to the engineering people, and it takes them about two months to offer a solution on paper. After that is inspected by the operations officers, it takes four months to work out the detail plans for construction. From that time on, until you get your first experimental ship, it is about 18 months. So you have two years' work before these first experimental models come out. Then it requires another six months to test it out. Usually, it takes another year to put them in production. So that you have a period of three years and a half before it gets into the hands of your troops in quantity.

Mr. OLIVER. Suppose you had a united air service; how much time would be required to do that?

Gen. MITCHELL. The time required would be less because you would have a definite policy of building and development which would allow you to organize specifically for it. You would have a central agency from which all of this engineering work would be done, instead of having different people handling it. You would have air officers in charge of developing planes, etc., and they would put a true value on them in the light of the experience they have had in the air. More important than all, the personnel would be trained tactically to use the equipment to the limit of its possibilities.

Mr. OLIVER. What is the life of a flyer?

Gen. MITCHELL. It all depends on the operations. In the operations on the western front during the war I figured on a loss of 100 per cent a month during periods of intense fighting.

Mr. OLIVER. What is the age beyond which it would not, perhaps, be safe to keep a man in the active flying service?

Gen. MITCHELL. That depends on his physical condition and not his age. He will be good up to 64 at least. You must have a graded service, with a definite hierarchy of advancement, the same as in any other service; it should be a regular life work for them. The great difficulty I had in Europe was in obtaining officers to handle the large aviation units.

Mr. OLIVER (interposing). Until what age?

Gen. MITCHELL. Until 60 or 70 years; depending on physical condition.

Mr. OLIVER. Do you think so?

Gen. MITCHELL. Yes, sir; I am sure of it.

Mr. OLIVER. My information was that after 30 or 35 years of age they would not be able to fly.

Gen. MITCHELL. That is a mistake. I know I am a better pilot to-day than I ever was. I am 41.

Mr. OLIVER. One objection raised to your proposal is that a separate service would soon load you up with men who could not render effective help in actual flying service.

Gen. MITCHELL. That is the same as in the Army or in any other military organization. You can not keep up a war organization in what we call a regular service; you must have a reserve service and an active service. What I want to see in aviation in this country is a personnel of one-fifth which will serve permanently, and which will constitute the nucleus on which to build up the full organization. The pilots in the lower grades should come from the reserve; those should all enter when young men. We would take a certain percentage of them to fill the loss and waste in the regular personnel.

But you can not train and maintain a service as complicated as the Air Service is with all the communications that are necessary, all the airplanes, and the system of tactical operations, etc., without giving it a proper organization of its own, and having men trained through years. It is the most complicated branch of the service that we have. That is why we have to have a permanent personnel in order to keep it up. And I want to impress the committee with the fact that the tactical end of it is much more important than the technical end. If you do not have your tactical end of it worked up properly, you have no chance to develop an efficient service. So that the relation of a flying officer to the flying service is very much the same as that of any other officer in the Army to his service; he com-

mences as a second lieutenant, "with a pack on his back." As he progresses in rank, he gets on a horse, and as a general, in an automobile. The air general has his post of command in an airplane or an airship. The air forces must be handled in the air, and not by a nonflying personnel at a desk.

(Thereupon, at 5 o'clock p. m., the committee adjourned.)

Saturday, February 5, 1921.

The committee met this day at 10.30 o'clock a. m., Hon. Thomas S. Butler (chairman) presiding.

The CHAIRMAN. General, we will be indebted if you will proceed with the statement you were making yesterday at the time of adjournment.

Statement of BRIG. GEN. WILLIAM MITCHELL—Resumed.

Gen. MITCHELL. Mr. Butler, in beginning what I have to say this morning, I wish again to invite attention, first, to the characteristics of aviation; that is, its speed as compared with any other means of warfare that we know of; that is to say, its speed as compared to an army moving on a railroad, which we may estimate at from 20 to 30 miles an hour, while the speed in the air is from five to eight times as great, and its speed as compared to any body moving on the surface of the water is about the same—that is to say, an object moving on the surface of the water has a speed from 20 to 40 miles an hour, while the speed in the air is from five to eight times as fast. An air force, therefore, from speed alone, always has the power of initiative.

I pointed out to you yesterday that it was necessary to get control of the air in order to be able to operate either with observation aviation, bombardment aviation, or attack aviation. In order to determine which side is to obtain control of the air, we must have aerial battles, and that is essentially an air matter. If another airplane is "sitting on your tail" in the air, it makes no difference whether you are a good naval officer or an army officer. In fact, it is a positive disadvantage, because you will have taken a lot of time studying stuff that does not concern the air. Observation aviation, which forms only a very small part of your total aviation, is merely an auxiliary of either armies or navies, and is a passive outfit. It has no offensive power to speak of. If you have no enemy in the air, then your observation aviation can work, it can adjust the fire of your artillery, it can reconnoiter, and it can act as a means of communication; but without offensive aviation that can fight the enemy, which can be concentrated and control the air wherever it is necessary, your observation aviation can not work.

Mr. BRITTEN. Are you talking to us this morning with a view to defining your desire for an united air service and the effect of that air service on the Navy, or are you talking to us in a general sense as to aviation?

Gen. MITCHELL. I am talking to you in a general sense as to the characteristics of air power as it is understood in the world to-day,

and from that we can deduce what the organization should be for carrying it into effect.

Mr. BRITTEN. What I would like to have you dwell upon and remember is that we are now considering a united air service, and we also want to know what effect that united air service is going to have on the Navy and how it is going to carry itself in naval operations.

Gen. MITCHELL. I will come to that.

Mr. BRITTEN. I wanted to make sure that you had that in mind.

Gen. MITCHELL. I will come to that in just a moment, if you will allow me to proceed. I have been speaking about the characteristics of air power, and the weapons from the air, as I explained yesterday, are gas, explosive bombs, and gunfire. With projectiles on the ground you have about 2½ per cent of explosives; with torpedoes you have about 20 per cent of explosives, and with aerial bombs you have 50 or more per cent of explosives, and we contend that a high explosive to-day has a greater effect than any other projectile, if you get a high order of detonation.

Mr. BRITTEN. If that is correct how do you account for the fact that the Germans were more successful in the Jutland fight with their armor-piercing shells than were the British, who used high-explosive shells?

Gen. MITCHELL. I believe it was due to the fact that the armor-piercing projectiles perforated the armor whereas the others exploded without piercing. The percentage and total weight of explosive in any gun projectile is small. It is said that the *Doerflinger* in that battle got 25 hits clear through her with 12-inch shells or larger, and that she made port under those conditions. Those 25 shells did not contain any more explosive than one bomb of a ton weight.

Mr. BRITTEN. You do know that the British were using high-explosive shells and that the Germans were using armor-piercing shells, and that the British, after the battle, discarded all the high-explosive shells and used nothing thereafter but the armor-piercing shells?

Gen. MITCHELL. I have heard that is the case, and it seems entirely reasonable.

Mr. BRITTEN. Assuming, then, that that is correct, how do you account for the statement that the high-explosive shell is the real thing?

Gen. MITCHELL. I am not speaking about the high-explosive shell, but a high-explosive bomb, or something carrying a greater volume of high explosives, because we carry a volume of high explosives in a bomb which compares as 2½ per cent in the shell to 50 per cent in case of the bomb. We can carry in the air projectiles of any size within the limit of a couple of tons, and we want to make them as large as is necessary to accomplish our object. If a 1,000-pound projectile is not large enough we will make one of 2,000 pounds; if that is not big enough we will make a 3,000-pound projectile, and we will keep on going up. The Coast Artillery has just finished a test in shooting at the battleship *Massachusetts*, and our officers concluded from that test that it was better to drop even a projectile loaded with sand, with a striking velocity of about 700 feet, which will pierce right through the decks of a ship, than it is to use a high-explosive rifle projectile fired against its side.

Mr. BRITTEN. That is probably because of the protection.

Gen. MITCHELL. Exactly, that is the proposition. If you multiply that by high explosives your effect will be very much greater. We want to demonstrate all of that before we make a final determination; we will want to tie live creatures around there, goats and things like that, so that there will be no doubt about it. We are only on the threshold of the development of air weapons.

AIRDROMES AND AIR ROUTES.

Let me go ahead with the other proposition about air power. In order to apply this air power you must have airdromes. You must have a place from which to fly off and means of communication, so that the air power can be applied at the place that is most necessary, and those things must be organized beforehand; we have to study all of these matters because we have to be ready to apply them. There is a system of airways that we have laid out for flights across the country [indicating]. We can tell you just how long it takes to concentrate from one place to another. We can go and have gone from one side of this country to the other in 25 hours of flying time.

Mr. HICKS. Are those stations actually established?

Gen. MITCHELL. They have been landed on, but on account of the fact that we have no Federal jurisdiction over aviation we just have to act in the way of comity with all the municipalities. We have had to get them to help us out, because we have no means of safeguarding either passengers or freight going in ships or of safeguarding the planes in the air by law.

Mr. HICKS. What I am getting at is this, does the Government own those places?

Gen. MITCHELL. No, sir. This is simply a layout of air routes which, if we had to go to war to-morrow, we would put into practice immediately. We have every one worked out as to the amount of gas, oil, spares, and everything that should go to each place in accordance with the character of the campaign.

Mr. BRITTEN. As I understand, you have landed at each one of those places?

Gen. MITCHELL. Yes, sir. Capt. Streett went to Nome, Alaska—which is Asia, practically—in 56 hours flying time, and he came back. He never lost a man and he never lost a ship. It was one of the greatest trips ever made.

Mr. OLIVER. What was the actual time?

Gen. MITCHELL. Three months and five days for the round trip.

Mr. BRITTEN. That is quite different.

Mr. OLIVER. How much can you cut down the actual time?

Gen. MITCHELL. You mean the time of going there?

Mr. OLIVER. Yes.

Gen. MITCHELL. With the equipment we have now that flying time could not be cut down very much, and the equipment we have is very crude. But if we had an organized airway there, with aids to navigation, with airdromes, and with directional wireless, we could make it in the flying time indicated plus the time required to take on fuel, or about 70 hours.

Mr. OLIVER. That is, you would have relays in case of accidents?

Gen. MITCHELL. It would be necessary to put airdromes about every 200 miles with the equipment we have to-day.

Mr. BRITTEN. What would it cost to prepare airdromes for those various locations?

Gen. MITCHELL. I think that if those things were prepared and economically and efficiently directed, you could make money out of them. You could put fences around them on which advertisements could be carried, and give training and exhibits of what airplanes can do, both industrially and commercially.

USES OF THE AIRPLANE INDUSTRIALLY.

Let me here insert into this testimony two of our proposed uses of the airplane industrially, a glance at either of which will convince you that there is a real future for commercial aviation. First, there is the use of the airplane photograph for map making. A great deal has been said about this, and a Federal board for its consideration has actually been established, but as yet the public does not appreciate the value of this wonderful development. These maps may be used in many ways. Take, for example, the farmer's use of them for agricultural purposes; a map taken from the proper altitude will show the nature of the soil, will show the farms in all details, the roads, bridges, systems of drainage, telegraph and telephone lines, power lines, gas lines, forests, scrub land, reveal in graphic form (for it will be in its true light) the comparative value of the farm and of the farmer's daily work; in each county each farmer will be under the eye of his neighbor, with mutual benefit to every man in the community.

This photograph, in the form of what is called a mosaic, could be taken by counties in each of the 3,900 of this great country. If it tends to more scientific agriculture by stimulating better farm management, if it tends to more intensive cultivation by revealing to the eye and bringing into cultivation waste areas for generations idle and sadly neglected in our agricultural districts, it is not unreasonable to hope that it will increase the production of this country in agriculture one-tenth of 1 per cent. The total agricultural production of this country last year was \$19,000,000,000. The proper application of the airplane photograph alone should, therefore, make this country more wealthy each year in the future to the extent of \$19,000,000.

But it will not be to the farmer alone that this airplane map will be useful. Take, for example, mining engineers and the gas and coal industry. In the coal industry it will give an exceedingly accurate base map and save thousands of dollars per year on survey crews and check survey crews. Take the gas industry of Pennsylvania, and as a concrete example one particular county, Butler County. A map of this territory is desirable in the gas development at this time showing the roads, streams, railroads, farm lands, farm acreage, the name of the farmer, and other detail. It would take three survey crews three years and probably cost \$40,000 to get this map. An airplane can secure the base for it in one week at a cost of not more than \$3,000, ten times more cheaply; but that is not the great feature; it is ten times a better product in this work for the simple reason that it is not merely a conglomeration of conventional signs, as a map is, but it is an actual photograph of the territory to be developed.

I submit that the development of the Pennsylvania coal fields is one of the prime basic future industries of this Nation, and I contend that the airplane photograph will be of inestimable value to the counties, the State of Pennsylvania, and to the Nation in the furtherance of this all-important work.

I dare not enlarge on the possible future activities of the airplane and of the navigators of the air because I might be called a dreamer. In all my statements or conjectures on air power I speak from actual experience in the World War. If the plans of some scientists of international repute, who are considering the upper air problems, come true, we may be able to convert our most arid wastes into fruitful land and we may be in a position to prevent famine and the starvation of millions of people as is now actually the case in China, by insuring sufficient rainfall in areas that are sufficiently productive in seasons of good moisture and rainfall. Very concrete propositions along this line have been gone into by me this week, and we shall try them in the autumn.

The every day uses of an airplane may be stated as follows:

I. CIVIC.

- A. Architectural studies of individual buildings or groups of buildings.
 - 1. Progressive photographs showing development at various stages.
 - 2. Studies to get influence of surrounding buildings.
 - 3. Bird's-eye views of existing groups—for modification or development.
- B. City planning and improvement.
 - 1. Studies of river and harbor terminal problems.
 - 2. Observation of river flows, to determine location of breakwater channels, etc.
 - 3. Street layouts, parks, etc.
 - 4. Building problems—congestion, fire regulations, etc.
- C. Ambulance service.
 - 1. Transfer of patients from vessel to hospital.
 - 2. Physicians for emergency cases.
 - 3. Transportation of surgical instruments and supplies.
- D. Police patrol.
- E. Fire patrol.
 - 1. Fire location and district surveys.
 - 2. Smoke nuisance investigations.

II. NATIONAL.

- A. Forestry.
 - 1. Mapping of forests.
 - 2. Location and reporting of fires.
 - 3. Photographs of forests for isolating infected areas.
 - 4. Patrol against raids and depredations of any character.
 - 5. Location of desired timber.
- B. Boundry patrol.
 - 1. Customs and revenue service.
 - 2. Coast guard.
 - 3. Location of wrecks, derelicts, and other menaces to navigation.
 - 4. Location of vessels in distress, particularly where radio communication has failed.
 - 5. Prevention and suppression of aerial smuggling.
 - 6. Search of areas in western rivers, in flood times, for refuges and speedy acquisition of information concerning condition of settlements out of communication with outside world.
 - 7. Establishment of communication by line between vessels on shore and the beach when vessel is beyond the range of line guns.
 - 8. Occasional uses where practicable in actual rescue from the water of persons in danger of drowning.

G. Mail service.

1. Catching outgoing steamers with important mail or other messages.
2. Delivering mail to and from dirigibles and large airplanes.
3. Receiving mail from incoming steamer, while long distances at sea.
4. Transoceanic and transcontinental mail, express, and passenger carrying.

D. Military and naval.

1. Attack of all enemy elements in the air.
2. Liaison with infantry.
3. Messenger service at high altitudes.
4. Prevention of enemy air attacks on friendly ground troops.
5. Artillery adjustments.
6. Visual reconnaissance.
7. Bombardment raids.
8. Artillery surveillance.
9. Coast patrol.
10. Communication between fleet commander and cooperating forces on shore.
11. Assisting in naval blockades.
12. Offensive against submarine and torpedo boats.
13. Location of mines.
14. Adjustment of shore batteries.
15. Photography of results of bombardment.
16. Photography of friendly works to improve camouflage.
17. Dropping maps, locations, orders, and information to friendly troops.
18. Dropping propaganda.
19. Guide to advancing troops.
20. Landing raiding parties back of lines.
21. Photographic reconnaissance.
22. Attacks on ground troops.
23. Incendiary bombardment.
24. Supplying food and ammunition to isolated posts.
25. Destruction of battleships.
26. Raids on hostile batteries that can not be reached by artillery.
27. Adjustment of fire from ships.
28. Location and destruction of enemy submarines.

E. Official Government service.

1. Personal service to officials.
2. Dispatch service between officials.

F. Map making and national survey.

1. City mosaics for Government improvement of rivers and harbors.
2. Country mosaics for determination of landing fields.
3. Meteorological surveys.

III. COMMERCIAL.

A. Landscape gardening.

1. Preliminary study of grounds for preparing development plans.
2. Progressive study and development.

B. Engineering studies.

- (a) Factories, buildings, and massive construction work.
 1. Progressive photographs.
 2. Observations from all angles for inspection purposes.
 3. Studies of the local ground and adjacent territory for dam work.
 4. Repair work serve department for telephone and telegraph companies carrying crews.
 5. Inspection power, telegraph and telephone lines.

C. Shore lines.

1. Studies on the movement of tides and currents for shore breakwater dement.
2. Taking of soundings in shallow or swampy country, not open to navigation.

D. River, harbor, and dock improvement.

1. Studies of river traffic, river flow, and location of docks and terminals.
2. Dredging studies, from observations of flow of streams.

E. City planning.

1. Topographic studies of ground layout for planning streets, water systems, etc.
2. Photographic studies as basis of development.

- F. Mine communications.
 - 1. Carrying precious ore and stones to outlet and rapidly bringing in supplies to regions which can not readily be reached by other transportation facilities.
 - 2. Payroll transportation.
 - 3. Transportation of officials on inspection tours.
- G. Explorations and reconnaissance of new routes—railroads, trails, routes.
 - 1. Aerial surveys of new vehicle roads, railroads, etc.
 - 2. Topographical—photographic surveys.
 - 3. New regional exploration.
- H. Delivery routes: Department stores, newspapers, etc.
 - 1. Regular merchandise delivery.
 - 2. News service—distribution of matrices and illustrations to rural or other newspapers and journals.
 - 3. Delivery of fish, milk, and perishable produce to distant markets.
 - 4. Delivery of spare parts—small pieces of machinery or mechanical apparatus. failure of which delivery makes hundreds of men idle.
 - 5. Pelt and fur delivery to markets.
 - 6. Delivery of clearance papers to vessels outbound.
 - 7. Supplying rations, or materials, at inaccessible places while on exploring expeditions or in case of injury by storm.
- I. Publicity stunts and advertising.
 - 1. Department stores.
 - 2. Conventions.
 - 3. Recruiting campaigns.
 - 4. Newspapers.
 - 5. Theaters.
 - 6. Real estate sales.
- J. Forestry survey.
 - 1. Location of special service stock.
 - 2. Fire acres.
 - 3. Swamp areas.
 - 4. Condition of growth.
 - 5. Planning of logging routes.
- K. Ranch service.
 - 1. Herding cattle, locating lost or strayed droves of animals.
 - 2. Inspection of ground and rapid location of good grazing territory.
 - 3. Heading off stampeding cattle on ranges.
 - 4. Communication on large scattered farms and ranges.
- L. Chamber of commerce reports—Progressive studies.
 - 1. Photographs of important buildings and works in cities.
 - 2. Noting development of sections of cities.
 - 3. Furnishing evidence for necessary betterment legislation.
- M. News files and motion-picture films.
 - 1. Reporting races, giving progressive views.
 - 2. Bringing reporters quickly on scenes of news.
 - 3. Motion picture of big events.
 - 4. Carrying of pictures quickly to theaters.
 - 5. Special copy service.
- N. Service—Special dispatch.
 - 1. Passenger carrying.
 - 2. Sight-seeing over cities.
 - 3. Regular air taxi service.
 - 4. Commercial routes between cities.
 - 5. Hotel service, carrying guests to golf links, etc.
- O. Agricultural.
 - 1. Farm surveys showing physical conditions, crops, fences, etc.
 - 2. Sheep and cattle herding, locating lost or strayed stock.
- P. Fisheries.
 - 1. Scouting for whales or schools of fish.
- Q. Commercial financial transactions.
 - 1. Pay roll delivery over dangerous territory.
 - 2. Fire underwriters' examination of districts from the air, noting congestion, natural fire barriers, etc.
- R. Aviation schools.
 - 1. Training of pilots.
 - 2. Passenger raids.
 - 3. Exhibition flying for industrial expositions, fairs, carnivals, etc.

IV. PERSONAL.

- A. Commuting.
 - 1. Overland travel to business.
 - 2. From summer home to city.
 - 3. Missionary societies operating in localities that are far out of regular paths of travel.
- B. Personal service.
 - 1. Service vehicle for doctors and other professional men.
- C. Pleasure.
 - 1. Vacation trips, week-end trips, etc.
 - 2. Fishing.
 - 3. Flying to and from hunting trips.
- D. Sports.
 - 1. Racing.
 - 2. Cross-country touring.
 - 3. Establishing of new record.
 - 4. Photography.
 - 5. Hunting.
- C. Scientific.
 - 1. Observation of celestial bodies above earth's dust layer
 - 2. Geographical studies.

V. MISCELLANEOUS.

Smuggling and countersmuggling.
 Burglary, arson, kidnaping, cattle stealing, bootlegging.

The following is a statement regarding the Forestry Service, together with copies of two letters, one from the Secretary of the Department of Agriculture and the other from the district forester, San Francisco, Calif.

REPORT OF THE FOREST FIRE PATROL IN THE WESTERN DEPARTMENT, 1919.

National forests have for their object—to insure a perpetual supply of timber, to preserve the forest cover with regulates the flow of streams, and to provide for the use of all resources which the forests contain, in the ways that will make them of largest service.

Fire, above all else, threatens and destroys present and future timber supply. It is through the destruction of forest and brush cover, a contributing cause to floods and their accompanying damage. It damages and destroys such other resources of the forest and forage; and it lowers, at least for long periods of time, the value of forests as health and recreation grounds for the people of the community, State, and Nation.

It follows, then, that fire protection is the most important activity of the United States Forestry Service. As a matter of fact, methods by which adequate forest fire protection may be given to the national forests is a problem on which the best efforts of forest officers have been concentrated ever since the inception of the forestry movement in this country. As a consequence, a complete and comprehensive protection plan has been devised and the necessary equipment and personnel secured. The plan has been in operation for some years, with such modifications, additions, and changes as time, careful inspection, and thought, and painstaking scientific investigation in the various actions and results of forest fires have seemed to warrant.

REPORT OF AIRPLANE FOREST FIRE PATROL.

The first mention, so far as is now known, of the use of airplanes in connection with forest-fire protection was made in 1909, when a resolution adopted at a meeting of forest supervisors held in El Paso, Tex., called attention to the possibilities of this method of fire patrol of the national forests. The first actual application of this method was made in Wisconsin in 1915, carried out by a Curtiss four-passenger flying boat, equipped with a 100-horse power 8-cylinder Curtiss motor.

Early in 1919 the Forestry Service requested of the War Department that cooperation in fire protection by means of airplane fire patrol be given by the Air Service as an experimental measure, and on national forests in the vicinity of regularly established aviation fields. This request was met by the War Department with a great deal of willingness, because of the opportunity offered for a useful method for training.

Organized and sustained forest-fire patrol was, therefore, first attempted during the season of 1919. The service was first inaugurated in California. The work was performed by the Air Service, using its personnel and equipment. It was on an experimental basis, with the idea of determining the feasibility of using aircraft for this purpose by the actual establishment and operation of regular patrols, rather than by means of a few test flights.

Beginning June 1, air patrol was begun from Mather Field (near Sacramento, Calif.), from March Field (near Riverside, Calif.), and from Rockwell Field (near San Diego, Calif.). The individual routes established and followed were as follows:

From Mather Field there were two routes, the first going by Placerville, Auburn, and Nevada City to Oroville, with the return trip in the afternoon over the same route. The second patrol was from Mather Field to Placerville, thence south over the Eldorado Forest to Chinese on the Stanislaus Forest, the return being over the same route in the afternoon.

From March Field two routes were established, the first covering a circle on the Angeles Forest. The second route circled eastward to the south side of Mill Creek on the Angeles Forest, swinging south over Banning and covering the western slope of the San Jacinto Mountains, and the heads of the San Jacinto River on the Cleveland Forest, in turning back toward its base.

From Rockwell Field one patrol was established, the route covering the central portion of the Descanso district and the northeastern side of the range on the Palomar district, thus completing a patrol of the entire Cleveland Forest.

Thus, beginning July 1, five daily patrols covering national forest areas of exceptionally high values were in operation, and twice each day five ships covered the better part of some 6,000,000 acres of rough mountainous heavily timbered country. The average nonstop run was in the neighborhood of 160 miles; the average round trip some 320 miles.

The opening of the hunting season in northern California in August witnessed a critical flareup of fires. An unusual number of fires was reported and for various reasons several of them assumed alarming proportions. Extension of the air patrol to cover practically all of the national forests of California was asked by the Forestry Service, and was granted by the Western Department Air Service. Two new bases, one at Red Bluff and one at Fresno, were promptly established.

Existing air-patrol routes were modified. The Curtiss planes were replaced by De Havilland 4's and on September 1 complete patrol twice daily of 15 out of the 17 national forests in California was inaugurated.

From Red Bluff the first of these new routes led east and north around Mount Lassen, across Hayden Hill to the landing field at Alturad. The afternoon patrol went west across the Modoc to the Shasta lava beds and the vicinity of Mount Shasta to Round Mountain, east to the eastern edge of the Lassen and south and west again to Red Bluff. The second patrol out of Red Bluff went west to the California Forest, north to Delta, thence west over the Salmon River and Klamath River country, and back to the field at Montague. The afternoon run covered the country from Montague west and south over the Solman River country, south for the full length of the Trinity National Forest on the coast side and south for the full length of the California Forest on the coast side to a landing field at Lakeport. From Lakeport the return to Red Bluff was made via the valley side of the California Forest.

The first patrol from Fresno went east over the Yosemite to the landing point at Chinese, which was the southern run of the second of the Mather Field patrols. The return trip was over the same route. The second Fresno patrol went east over the high country, south across the Sequoia Park and the Sequoia Forest to Bakersville. The return trip was made over the same route in the afternoon.

On or about September 1, in addition to the service rendered by regular forest patrols, aviators on cross-country flights and balloon observers at Arcadia were under instructions to report promptly to the proper authorities any and all fires which they might discover. In addition to these regular patrols by airplane the balloon school at Arcadia stationed a balloon at an elevation of about 3,000 feet, where a view was had of the country on the south slope of the San Gabriel watershed between San Dimas and La Canada.

Observation was accomplished by Air Service personnel except, as quite often happened, forest officers took flights, either for the experience to get first-hand information as to the possibilities of airplane control, or on special occasions to get first-hand, definite information about the fire situation in general or about conditions in some individual fire.

ACTUAL ACCOMPLISHMENTS OF AIRPLANE PATROL.

The outstanding feature of airplane patrol in California during 1919 was the fact that, with no previous planning, daily and practically uninterrupted service was continued from June 1, the date originally set, until October 31, the end of the fire season.

For the period June 1 to August 30 five patrols covered twice each day an acreage of some 5,035,142 acres of land within five national forests, and in addition an unestimated acreage of private lands outside the forests was also covered. The Government timber patrolled during this period is estimated at 20,219,565,000 feet, board measure, worth some \$40,439,130. In accomplishing this work a total of approximately 745 flights actually covered 92,605 miles. There were discovered, located, and reported a total of 118 fires, 23 of them being both discovered and reported in advance of the regular Forest Service detection organization, which was, since the airplane was experimental only, still on the job.

Beginning September 1, airplane patrol was extended to cover 15 out of the 17 national forests in the State. From September 1 to October 31, daily airplane patrol covered then some 21,484,368 acres of land within the national forests, on which was growing 105,112,460,000 feet of Government timber, worth some \$210,224,920. In addition to the figures given above, a very appreciable acreage of private timber lands outside the national forests was covered by the patrol, and it is entirely probable that the figures for stumpage and for the value of that stumpage might approximately be doubled if the total amount and value of all timber covered by airplane patrol in California were sought.

The total number of flights, number of miles covered, fires discovered, etc., for the entire season—June 1 to October 31—is according to data received as follows:

Field.	Miles.	Total fires discovered.
Mather.....	47,658	155
March.....	68,549	147
Rockwell.....	36,854	24
Red Bluff.....	20,239	107
Fresno.....	19,709	9
Total.....	202,009	442

Suppression.—It has been found entirely practical to get quicker, more complete, and more satisfactory progress reports either on a series of small and widely scattered fires or on large conflagrations by means of the airplane than by any other method so far tried. In fact, the airplane patrol in California has performed a real and very vital service in connection with obtaining progress reports on fires and in connection with securing, quickly and accurately, information absolutely essential to the direction of suppression work. It was established beyond the shadow of doubt at the Tejuanga and San Gabriel fires on the Angeles National Forest, September 15 to 27 of 1919, that airplanes in connection with fire suppression have a real value and a value which can hardly be overestimated. These fires were in rough and inaccessible country. They eventually covered some 165,000 acres, and in their suppression better than 2,000 men were employed. The situation was, as a whole, probably the worst California has ever experienced.

The supervisor, realizing as soon as the fires assumed alarming proportions, that his most difficult problem was to keep informed of changing conditions on all fronts rapidly enough to direct operations in a way to get the most effective use of all fire-fighting forces, and at the same time to insure their safety, called on the Air Service, March Field, for assistance. A ship and pilot were promptly put at his service. Each morning the supervisor spent two or three hours flying directly over the fire. By the use of the plane he was enabled in this short time each day to view the progress of the fires and to get reliable and accurate information on which camp locations were decided, fire lines determined, men moved, and, in short, the entire fight directed.

Furthermore, airplane reconnaissance added greatly to the safety of the men fighting the fire, since it was possible to tell from a ship much sooner than from the ground when a camp was threatened. As a matter of fact, when the fires were at their height, the information obtained by the use of a plane in from one to three hours each day could not have been obtained by the usual methods employed (getting around the fire on foot or

horseback) in less than four or five days, and much of the information obtained in the latter manner would naturally have been useless by the time it could have been used.

Incidentally one forest officer, returning from such an inspection trip, determined from the atmospheric conditions he observed at comparatively high elevations that it was going to rain, and upon landing called by phone the Los Angeles office of the Weather Bureau and told them of the forthcoming shower, which had not been officially forecasted, but which actually materialized within 24 hours.

In view of this actual experience, it seems entirely possible that the estimate of a northern California supervisor, who figured that his fire-suppression expenses, totaling \$30,000, could have been reduced by one-third had planes been available for inspection and control on the larger fires, may be entirely justified.

FIRE COOPERATION—USE OF AIRCRAFT.

DECEMBER 6, 1919.

The SECRETARY OF WAR.

SIR: I had the pleasure of informing you by letter of October 29 of the success during the past season of the cooperative forest-fire patrol by airplane in California and the Northwest, conducted by the Air Service and the Forest Service. I expressed the opinion at the time that the development of aircraft for forest-fire protection and suppression seemed desirable as a permanent phase of forest administration.

I am informed that the experiences of the past season in airplane patrol have been thoroughly reviewed recently by the Air Service officer of the Western Department and local representatives of the Forest Service and owners of private timber, and that they have recommended the continuance of the cooperative plan on a more intensive basis for the season of 1920. The plan proposed contemplates a joint conference of Air Service and Forest Service representatives at March Field, Calif., for a period of from four to six weeks for the purpose of training the personnel of both services by suitable instructions and field work in the various phases of this new type of air control. The experience of the past season has shown the excellent results that may be expected from a thorough familiarity by the personnel of each service with the work and duties of the other.

The plan involves also matters of detail, such as securing quartermaster privileges at March Field for forest officers while serving there and the need of some additional airplane equipment for communication from the Signal Corps. If you agree with me as to the desirability of continuing the cooperative plan for the season of 1920, I would suggest that, if consistent with the policy of your department, the arrangements for perfecting it may be delegated to the War Department services directly concerned and the Forest Service. I hope very much that this project, which has proved so promising in its possibilities as a means of reducing the number and severity of forest fires, may be continued in 1920.

Respectfully,

D. F. HOUSTON, *Secretary.*

OCTOBER 1, 1919.

Lieut. Col. B. K. YOUNT,

Commanding Officer March Field, Alessandro, Calif.

DEAR COL. YOUNT: Now that the rain has put an end to the fire season, I want to write you and express my appreciation of the part played by you and the men of your command in the recent fire emergency on the Angeles National Forest. For the first time in the history of forestry, aircraft played a very important part in a big fire fight.

The three fires on the Angeles Forest had covered about 165,000 acres. Some 2,000 men were employed in the fight and the transportation and supply systems that we were able to organize were taxed to their utmost. It was the worst fire situation that I have seen during 18 years' service.

In any large fire fight, one of the most difficult problems is to keep informed of the changing conditions on all fronts rapidly enough to direct operations in a way to get the most effective use of all fighting forces, and at the same time insure their safety. The use of the planes provided by you for observation trips by Mr. Johnston, Mr. Charlton, and myself directly over the fire lines was a revelation as to the quickness with which up-to-the-minute information could be secured.

I remember fires on which 24 hours of the most laborious travel horseback and on foot were necessary to get a comprehensive idea of the perimeter of the fire—and one could never be sure that the situation had not materially changed during the dura-

tion of the trip. On the Angeles Forest I got a complete view of the line of the largest fires and platted it on a topographic map in an hour and a half flight.

On the information secured by these flights camp locations were decided, fire lines were determined, men were moved; in short, the entire fight directed. Furthermore, the airplane reconnaissance added greatly to the safety of the men fighting the fire, since it was possible to tell from a ship much sooner than from the ground when a camp was threatened.

In addition to your help in providing ships and pilots for the forest officers during the fight, you maintained the regular patrol and relieved us from the uncertainty that something was starting elsewhere undetected.

Your cooperation is sincerely appreciated both personally and officially by myself, and I want to extend the thanks of the Forest Service to you. In addition will you convey the thanks of the Forest Service to Lieuts. Foster, Brand, Collins, and Vassar for their work in aiding in observation during the fire fight, and Lieut. Moore, Morris, and Tonkin for their work in keeping up the patrol under trying conditions. I hope Lieut. Tonkin is none the worse for his nerve-racking experience.

Very sincerely, yours,

COERT DU BOIS, *District Forester.*

AIRDROMES.

Gen. MITCHELL. Every State and every municipality tries to get an airdrome, and as far as bringing people there is concerned it is a great advertisement for all those municipalities. In certain places where we have landed throughout the country people never had heard of those towns before. It is the greatest advertisement in the world.

The CHAIRMAN. I suggest that you advocate the construction of those airdromes along economical lines, but without having in mind getting the money back.

Gen. MITCHELL. You do not need any great amount of construction there, and there is no great cost in the proposition at all. The counties and municipalities will pay for most of the upkeep themselves when they appreciate its value.

Mr. HICKS. You would need a repair shop, would you not?

Gen. MITCHELL. Only a small repair shop, and as far as that is concerned they do not have to be put in except when being actually used. They can be put in very rapidly in time of war.

Mr. BRITTEN. Could airdromes be put in during time of war?

Gen. MITCHELL. Yes, sir.

Mr. BRITTEN. Where would you house your mechanical equipment?

Gen. MITCHELL. In tents. We do not need great structures for that purpose at all.

Mr. BRITTEN. I notice you have a number of places on this plan. You have one at Sydney. I do not know where Sydney is, but up in the north some place, I imagine.

Gen. MITCHELL. Yes, sir. It is on the direct route from East to West.

Mr. BRITTEN. You have Trinidad on here, Amirilla, and a few others, all unimportant little towns.

Gen. MITCHELL. People out in the country are very much interested in aviation. I can show you how the money put aside for aviation this year, which is \$100,000,000, if properly applied, would make us independent from an air standpoint. But the real point I want to make about this thing and about the application of air power is that you must have airdromes to work from, and it does not make any difference where those airdromes are, whether they are on the water

or on the land, they must be adapted to the class of ship that is going to fight in the air and we must make the airdromes on which they are going to land fit the airplanes. As I say, the airdromes must be made to fit the airplanes. That is the case with offensive aviation, because if you do not do that and the other man does it, and he has the speed, maneuverability, and gun power, he is going to shoot you out of the air.

In so far as observation aviation is concerned, where it is necessary to be very closely in contact with the troops on the ground or where it is necessary to fly off the turrets of battleships, there you must have a special kind of airplane to suit the ship you are working with. But to-day that only amounts to about 20 per cent of your total aviation, and it has no offensive power. The more you put into observation aviation the more you have to put into offensive aviation in order to protect your observation aviation. We had great difficulty in Europe in convincing the people that that was the case, because they were new to it and the system of observation aviation which grew up in Europe was very top-heavy; first, because there was no offensive aviation to begin with, and, next, because it was a war of position.

AIRPLANE CARRIERS.

Mr. BRITTEN. It does not necessarily follow that because a plane is flown off of a turret or off the deck of a ship that it is to be used only for observation purposes.

Gen. MITCHELL. Yes, sir; because you have not the runway there that will allow you to get the speed you get on a longer run; that is, the way battleships are constructed to-day.

Mr. BRITTEN. Then if we appropriated for two airplane carriers, you do not think we could fly anything from those carriers but observers?

Gen. MITCHELL. No, sir; that is not what I said. I said that an airplane carrier had to be built with an airdrome on it so that offensive aviation could land and start from that airdrome; it would have to be in proportion to the run on the ground of your airplanes that give you the greatest tactical value in the air.

Mr. BRITTEN. Let us assume that our Navy will have, at least in time, airplane carriers. The planes will do something besides observation, will they not?

Gen. MITCHELL. They will not do any observation from the airplane carriers except as a part of the air force in connection with their own offensive aviation.

Mr. BRITTEN. I think they will do all kinds of aviation work.

Gen. MITCHELL. You are in error there. You must put complete units of pursuit, attack, and bombardment aviation on them. If you do not put proper tactical units of aviation on those airplanes carriers you are going to get whipped.

Mr. BRITTEN. That is what the airplane carriers are for, and I should suppose the Navy would provide for all of that.

Gen. MITCHELL. But you must have on those airplane carriers a group of pursuit aviation, primarily, because your control of the air depends on pursuit aviation; it does not depend on observation aviation or bombardment aviation.

The CHAIRMAN. We have a duty here and we must perform it in some way. You have heard the statements made and I wish you would tell us what sort of a carrier you think we ought to have, because that is the practical end of all this.

Gen. MITCHELL. Yes; that is the practical end of the proposition. In order to apply your air power over the water you must have proper airdromes.

The CHAIRMAN. May I ask you a further practical question?

Gen. MITCHELL. Yes, sir.

The CHAIRMAN. How long would you build a ship?

Gen. MITCHELL. A ship should be 1,000 feet long.

The CHAIRMAN. How wide should it be?

Gen. MITCHELL. It should be just as wide as you can get it.

The CHAIRMAN. We might be able to get it 500 feet wide.

Gen. MITCHELL. But you probably could not get the speed under those conditions.

Mr. OLIVER. You want to limit it to the size of the Panama Canal, do you not?

Gen. MITCHELL. Yes, sir; that is a bad feature about it, Mr. Oliver.

The CHAIRMAN. I would like to know how wide it ought to be.

Gen. MITCHELL. I think we can get ships now with a deck 125 feet wide.

The CHAIRMAN. How could you get it through the canal?

Gen. MITCHELL. I think you can get it through the canal.

Mr. BRITTEN. The canal is 110 feet wide.

Gen. MITCHELL. They might have arrangements for extending the decks laterally as we do in some of our machine-shop trucks, which are arranged so they fold in and fold out.

Mr. PADGETT. In other words, you want to make a ship in the form of one of these accordions?

Gen. MITCHELL. Yes, sir; we have considered a good many arrangements for it. If you can not get one of suitable size to go through the canal, keep them on either coast and fly the aeroplanes across. The carriers should depart from conventional ship construction, be carefully tested out in wind tunnels and actually made to fit the airplanes, instead of making first a warship and then adapting it to airplanes.

Mr. PADGETT. Would you have a ship like one of these telescope bags, pull it in, go through the canal and then spread it out again?

Gen. MITCHELL. Yes, sir; in answer to Mr. Butler's question as to what size the airplane carrier should be, I want to have it understood that I think and we all think in aviation, that you must make the carriers so that airplanes of a certain class can land on them. Now, the pursuit airplanes roll, after they put their wheels on the ground, about 500 feet, and they can take off in about 300 feet with their total load. Here is the pursuit airplane that we use to-day [exhibiting photograph]. Attack airplanes roll a little bit more than that, about 600 feet, as will bombardment airplanes.

The CHAIRMAN. How many decks would you have to a carrier, because we could not carry many planes if we allowed each one to run 300 feet; they would knock all the others off the decks.

Gen. MITCHELL. Here are diagrams of a proposed carrier [indicating]. We have taken into consideration how best we can trans-

port our supplies, etc., in the absence of airplane carriers, of which we have none, and we have tried to study what ships we could get for the purpose of applying our theories. There is a big ship lying at anchor, called the *Leviathan*, and we have discussed how she could be converted; how much it would cost, and how long it would take. Her speed is low; it is only about 23 knots an hour.

The CHAIRMAN. What is your judgment as to the speed of these carriers?

Gen. MITCHELL. The carriers should be faster than anything else, if possible, 40 knots.

The CHAIRMAN. Faster than the fleet?

Gen. MITCHELL. Absolutely.

Mr. BRITTEN. If possible?

Gen. MITCHELL. Yes, sir; certainly. You can not get it unless you try it.

Mr. HICKS. What did you say was the run of these pursuit planes?

Gen. MITCHELL. About 500 feet after they touch the ground in still air.

Mr. HICKS. If a ship were going 23 knots an hour in the wind, what do you think would be the run off then?

Gen. MITCHELL. We are not exactly sure, because we have not had any airplane carriers in this country to try, and because England has absolutely stopped up all information. There are a lot of air currents, etc., that occur around a ship that we do not know a great deal about, but theoretically, if those carriers are properly stream lined, so that you can get away from the air stream, in other words, so you will not get a back pressure against you, of course you will land just so much slower in proportion to your speed. For instance, our landing speed for the present pursuit plane is about 50 miles an hour, and if you are going 30 miles an hour in the wind you will land at 20 miles and roll about 150 feet.

The CHAIRMAN. Is it a fact that England is ahead as to style of the carrier?

Gen. MITCHELL. Yes, sir. She is going ahead with construction on these carriers and is developing her air power as strongly as she can over the water.

The CHAIRMAN. I understand she has from 50 to 60 planes to each carrier now.

Gen. MITCHELL. I understand she has six carriers. This has been the general line of England's development of her aviation over the water: First, she provided observation aviation. She first got a boat and put a landing deck on it, and she went right at it to solve the proposition. She found that as soon as she provided observation aviation she had to have pursuit aviation to protect it. She found as to pursuit aviation that if it did not have the ability to move its airdromes away from the fleet she would have the air battle right over the fleet, just what she did not want; so she put more speed on these carriers, so as to get them out to fight ahead of the fleet. Having done that she began to consider means of attacking the hostile fleet through the air, that is, by bombs and torpedoes. She developed her aviation for the attack of hostile shipping so as to move the battle away from her fleet, so that the battleships might not have to fire a gun, and that is essentially an air force matter, a development of that kind, and if we are not going to be backward we have got to

solve the problem in very much the same way. I think we are five or six years behind.

The CHAIRMAN. I had hoped that we might benefit from the experiments made by others.

Gen. MITCHELL. My judgment is this: That you should have no carriers less than 1,000 feet long, or whatever is required for the Panama locks, and if that is not big enough you ought to put some in the Pacific and some in the Atlantic.

The CHAIRMAN. Let me see if I understand you. Do you mean a deck 1,000 feet long?

Gen. MITCHELL. A landing deck 1,000 feet long, or whatever size is necessary to permit them to go through the locks. But we must have carriers for planes which are suitable for fighting in the air; otherwise you will not have any air force that is worth using, and the next thing is to make them as wide as you can; then build your carriers to suit the particular kind of aviation you are going to use, first being sure that you get pursuit aviation, that is, build airdromes or carriers for pursuit aviation that can go out and fight the opposing aviation, otherwise you will be shot right out of the air.

The CHAIRMAN. In other words, we must provide airplanes with which we can clear the air?

Gen. MITCHELL. Exactly.

The CHAIRMAN. And carry them along on these carriers?

Gen. MITCHELL. Yes, sir. This is not a theory at all, because that part of it has been proved in war.

The CHAIRMAN. The gentlemen representing the Navy have advocated the very plane you are now indorsing. I have been directing your mind to the details and you have been very helpful to us. General, will you come down to the question of one air service, or a united air service?

Gen. MITCHELL. In the first place, air power has no relation to the number of ships you have in the water, or to the size of your Army on land, but it must be proportioned on the air force that the enemy can bring against you. We know about what can be brought against us. If you are going to meet this attack, you must bear in mind that it will not be confined to the coast, but that it will be extended to our interior cities.

The CHAIRMAN. How long could an airplane carrier maintain the airplanes she carries, without extra supplies?

Gen. MITCHELL. On the estimates that we have made, you could keep up enough equipment on those ships for about two months of continuous duty—that is, in fuel, ammunition, machine-shop facilities, spare parts, and personnel for all of the accessories, such as radio and photography, in ordinary operations.

The CHAIRMAN. I understand you to say that they can maintain all of those establishments on the airplane carrier?

Gen. MITCHELL. Yes, sir; just as completely as at an airdrome, except that it would be floating on the water. Now, they would have to have sufficient control of the water to be able to maintain that carrier on it. This may be obtained by the Navy, by the air, or by both.

Mr. BRITTEN. Is not the chairman's question based upon the supposition that the offensive power has no navy whatever, and has been wiped completely off the sea?

Gen. MITCHELL. That is the chairman's assumption.

Mr. BRITTEN. Is not that an extravagant assumption?

Gen. MITCHELL. Not if we are attacked by a nation having a sufficiently well organized and equipped air force.

The CHAIRMAN. Let us see if violence was done in the assumption that you speak of. I did not mean to be violent, because I do not feel at all belligerent this morning. I asked Gen. Mitchell how these airplanes would be maintained after they got over here, and he answered that question very intelligently.

Gen. MITCHELL. I am glad to hear that.

The CHAIRMAN. I never for one moment assumed that we would not have some preparations made here. Of course they would be well away from base, and Gen. Mitchell's explanation was that they would be based upon the airplane carriers.

Gen. MITCHELL. Yes, sir.

Mr. BRITTEN. Going a little further with that suggestion, when they attempt to cross, we will have you, Gen. Mitchell, and you will have some planes in your service.

Gen. MITCHELL. We will attack that carrier the minute she gets within range of the coast, provided we have the planes, ammunition, and organization, which we have not now.

Mr. BRITTEN. Of course, you would not sit around the coast for two months.

Gen. MITCHELL. If they had control of the air, they most certainly would remain.

Mr. BRITTEN. But you would not have to meet them—

Gen. MITCHELL (interposing). One nation could do it right now.

Mr. BRITTEN. You must have a good many planes.

Gen. MITCHELL. We have many old ones which in some ways are worse than none at all, because they give an idea of false security. We have only one pursuit group to-day, composed of obsolescent planes, with a speed of 120 miles per hour. They would be fair game for any modern planes that might be brought against them. They are planes that were brought from England, France, and Germany.

Mr. BRITTEN. I think at every place where the committee went last year, we saw boxes and boxes of Army planes, and I would suppose that you would not be short of planes. What are they going to do with them—scrap them?

Gen. MITCHELL. We will use them for instruction purposes at the schools, and for civil purposes, such as the forest patrol. We will use them at places where we would not come in contact with an enemy. If those ships were taken out and the attempt made to use them against a first-class air power, it would be worse than not sending them out at all.

Mr. BRITTEN. Even though we are 3,000 miles away from any first-class power, they could come over to us?

Gen. MITCHELL. Yes, sir. The question of the application of air power is entirely a question of the airdromes' position. If they come within 200 miles of the coast, they can fly to their base or airdrome without your knowing that it is there. It is all dependent upon how much control they have of the air. They can conceal their airdrome, and, as I have said, it is entirely a question of the control of the air.

Mr. OLIVER. I understand, General, that you were asked about the possibilities of the offensive, and that suggests the preparation for defensive.

Gen. MITCHELL. So far as the defensive is concerned, we had a great deal of experience with that in Europe. You must coordinate every branch of your defensive means to further the end. In the first place, you must have your communication system—

Mr. OLIVER (interposing). I think the committee would be more interested in a general discussion of the offensive and defensive possibilities of aviation, and what you feel will be its probable development, rather than a recital of details.

Gen. MITCHELL. As a general proposition to-day, from the standpoint of the offensive, if we are allowed to develop the equipment that we have already begun to develop and are developing, I think that we can sink or destroy any naval ship that comes within 200 miles of our coast, whether armored or otherwise. In doing that we are taking into consideration the possible development of ships of 50,000 tons carrying 20-inch guns.

Mr. OLIVER. If that should be an airplane-carrying ship, you could extend your offensive?

Gen. MITCHELL. It can be extended in proportion to the number and class of airplane carriers you have and that can be maintained upon the water. That is a naval matter. We can tell you what we can do against a hostile ship with air forces.

PERSONNEL REQUIRED FOR AIRCRAFT.

Mr. OLIVER. Just awhile ago you began to discuss the question which the chairman called attention to: Can you tell us what personnel is required to man the types of ships you have described?

Gen. MITCHELL. You can figure on an average of 20 men to the ship, right straight through. That is the personnel required to maintain a ship, including its armament and equipment, and including the wireless and photographic apparatus, etc., and the supply depots behind it—10 men with the ship, 10 men in the supply points behind. Now, as to the navigating personnel, a single-seater requires one man, the observation ship requires two men, while the bomber requires four men.

Mr. OLIVER. Are they included in the number you gave as the average personnel?

Gen. MITCHELL. No, sir; the navigating personnel are officers on aircraft.

Mr. HICKS. Are your 20 men for the ship or on the ground?

Gen. MITCHELL. They are on the ground in the tactical unit, supply department, and shops. If you organize your air service upon the basis of airplanes, you must figure on 20 men to the ship.

Mr. OLIVER. Does that 20 include those who operate the ships?

Gen. MITCHELL. That is exclusive of those who operate the ships in the air.

Mr. OLIVER. You have given us the number of the personnel required to man the ships in flying?

Gen. MITCHELL. Yes, sir.

Mr. OLIVER. And that number is in addition to the 20?

Gen. MITCHELL. Yes, sir. This ship that will be finished next summer will require a navigating personnel of 11, but it will have a radius of action of 1,300 miles. The navigating personnel will constantly increase with the size of the ships.

PRODUCTION OF AIRCRAFT.

Mr. OLIVER. If you determine on the type of ships you require at present, and if you have facilities for producing such ships, how quickly could you turn them out?

Gen. MITCHELL. About one year at a minimum.

Mr. OLIVER. There would come a time, of course, when your quantity output would greatly increase?

Gen. MITCHELL. Yes, sir; by that time a new type would have been developed probably.

Mr. OLIVER. How quickly could you reach that point?

Gen. MITCHELL. At the beginning of the campaign we will be told what the policy of the Government is and how long they think the war will last. We will know approximately the number of ships the enemy air force has, their degree of excellence, and their military ability. On that basis we will figure how many airplanes we ought to have, what our wastage per month will be, what the replacements will be, and within six months after our initiation of production we will have reached about the maximum rate of production in planes and engines or have worked to the maximum capacity, and from then on the ships would be delivered constantly.

Mr. OLIVER. And delivered in great numbers?

Gen. MITCHELL. Yes, sir. In any new thing you can figure on a lagging with the engines and ships for about six months before they can begin steady production, this time being required to "tool up," if you have all your production data ready.

Mr. PADGETT. I would like to ask you a practical question, not so much with reference to the theory of your plan: We have appropriated and expended hundreds and even thousands of millions of dollars for airplanes, and yet every officer who comes before us will say that we have nothing in the way of airplanes. Why is it that we have not got any?

Gen. MITCHELL. There are two reasons for that.

Mr. PADGETT. After having expended a couple of thousand of millions of dollars for airplanes, you still tell us that you have only one squadron. How many planes belong to that squadron?

Gen. MITCHELL. I said that we had just one group of obsolete pursuit planes. That is all we have.

Mr. PADGETT. You say you have a little group of pursuit planes and yet we have expended about \$2,000,000,000 for planes. Why is that?

Gen. MITCHELL. I will tell you why.

Mr. PADGETT. As a cold business proposition, why is that?

Gen. MITCHELL. As a cold business proposition, there are two reasons for it: In the first place, we were precipitated into the war without any organization whatever for the creation and upkeep of air forces. In spite of all the representations that air officers made we were without a trained personnel to handle it, and the few officers

that knew anything about flying or air work were so junior in rank that their voice was absolutely lost in the wind. In the second place, as it was not appreciated what air forces meant, we were compelled to take types of planes that none of us wanted—that is, types that did not give us a balanced force of bombing, pursuit, and attack planes.

In the next place, the progress of aviation is so rapid and ships become obsolescent so quickly, that the material which was of a design about two years old when we got it was hopelessly behind times. These are five years behind the times now. Planes of wood and wire construction undergo tremendous deterioration in the depots, and they will not last over a certain time, or not over three years. For that reason, they are dangerous to fly in now. Primarily, from the standpoint of efficiency, you have got to have an organization that is capable of handling this proposition, and you will never have an efficient organization until you have in control flying officers who know something about it. That is a primary consideration, and they have had the same experience in every country in the development of an aviation service.

Mr. PADGETT. I do not understand why we can not jump over that interval of slowness and of being behind the times. If we saw that we were three years behind the times, why did we not catch up with the procession?

Gen. MITCHELL. If you did not have people who knew that they were three years behind the times, you could not do it. We are five years behind the times now.

Mr. PADGETT. Do you say that our people do not know that they are three or five years behind the times?

Gen. MITCHELL. Yes, sir; I do. The air officers know it, but the Army and Navy officers do not as a general proposition.

Mr. PADGETT. That is a sad commentary.

Gen. MITCHELL. Yes, sir; I think it is. We can not develop the aviation for the best interests of the country under the present system.

Mr. BRITTEN. I think the original war Chief of Aviation in the War Department was 25 years behind the times.

Gen. MITCHELL. I do not want to get involved in this discussion, or in cussing anyone out, because the shortcomings are the fault of all of us. We air officers are determined to give you the true evidence about aviation, and get an organization and equipment that we can fight with; and we want to give you 100 per cent return on the money you put into it. We want you to come and see our work yourselves and judge about it.

The CHAIRMAN. You know what is operating against you. The American people are determined that they will know, it matters not what it costs to get the information, what became of the \$1,400,000,000 we voted four or five years ago for this purpose. Of course, you have never seen the books and you do not know, but that is the thing that operates against aviation.

Gen. MITCHELL. We run into that at every place we go. You had a committee investigate, that rendered a report. If you burn your house down and you are out in the cold starving, is that any reason you should not build another one?

Mr. BRITTEN. Are you meeting the situation by your energy, your good head, and business ability generally, in the War Department to such an extent that you may hope for something better in the near future?

Gen. MITCHELL. Very greatly in the War Department, but I do not think you can develop good aviation under the War Department. You can not do it, because you are met at every turn by superiors who are not familiar with aviation, and are not in sympathy with it to the extent that an air officer is.

Mr. HICKS. Last year Congress created a corps of aviation in the Army, and that practically made it an independent arm of the service. Now you have full power and authority—

Gen. MITCHELL (interposing). We have in so far as being an arm of the Army is concerned.

Mr. HICKS. Why has not that service gone forward?

Gen. MITCHELL. It has gone forward, compared to what it was before. The most valuable thing about that was that when the aviation arm of the service was created, it was wisely provided by Congress that there should be a flying officer in command of all air units, and not more than 10 per cent of nonflying personnel in each grade. It is very important that the aviation service should be commanded by flying officers and by officers who know something about flying. That is the important thing, and it has had a most beneficial effect upon the personnel of our force, both from the standpoint of efficiency and from the standpoint of morale. We must have a high morale, and we will have that high morale only so long as the service is commended by officers that know their business. We were created a separate arm of the service, and we are given the privilege under the War Department organization of getting our own equipment.

This is the first time in this country that our aviation officers ever had in their hands the getting of equipment. The result is these various types of airplanes I have shown you to-day. They were beginning with them to a certain extent before, but we have put them through. Now, you are prescribing that the strength of the Army shall be fixed at 150,000 men, and that means that proportionate cuts must be made all along the line. Yet, our service is not organized, or should not be, in proportion to other arms of the service at all, but it should be in proportion to what the enemy can bring against us.

Mr. BRITTEN. That seems to be the rule that prevails—that is, for instance, that the artillery shall be in proportion or superior to the force that the enemy can bring against you.

Gen. MITCHELL. No, sir; your organization in the Army is based upon the tactical division, with the arms necessary to make the infantry fight. Everything is built up around the infantry. Everything is auxiliary to that. In the Air Service, the force, including the supply personnel, should be in proportion to the air force that the enemy may bring against you. It has nothing to do with the strength of the Army or Navy. If you have it as a part of the Army or Navy, then you make it subject to cuts up or down as the administrative control of those organizations sees fit. As the basis of the Army is the infantry division, and of the Navy is the battleship, where does the air force come in? Very far down. Take the development of the armament that you were talking about yesterday.

AERIAL TORPEDOES AND BOMBS.

Torpedoes are turned over to the Navy, instead of being turned over to the air force for development. The result is an attempt to adapt a ship's torpedo to air work; this ship torpedo is fired from vessels that go very slowly, 14 or 15 yards per second, while we go 60 yards per second. It is of practically no use to us in its present form.

Take bombs; the Army develops them and they are made primarily for use against land objects; whereas our first use of them will be against shipping in defense of the coast. We have no torpedoes in the Army Air Service; the Navy Air Service have none of our larger bombs. Neither of these weapons are suitable entirely for the air work required of them. Gas shells are the same way. We have not time to wait for some other outfit to develop these things that has not the same interest we have.

The CHAIRMAN. That is what we wanted to hear about.

Mr. BRITTEN. Are you suggesting that the Navy has a surplus of torpedoes that it does not know what to do with?

Gen. MITCHELL. I know that the Air Service has had to take what torpedoes the Navy had and attempt to apply them in air work for which they are not efficient.

Mr. BRITTEN. You have none of your own?

Gen. MITCHELL. No, sir.

Mr. BRITTEN. You could have gotten them, perhaps in a period of years, but you did not have them?

Gen. MITCHELL. No, sir.

Mr. BRITTEN. So that the only alternative was to take the Navy torpedo?

Gen. MITCHELL. No, sir; we could have developed our own for use from the air. Other people have done a lot of work along that line.

Mr. BRITTEN. You would have had to have an appropriation to build them?

Gen. MITCHELL. Yes, sir. We have had enough money.

Mr. BRITTEN. How long would it take to procure them?

Gen. MITCHELL. A year or so. We know a good deal about how they could be constructed and we can make efficient ones. Take armor-piercing bombs: We can make them to strike with high velocities, for instance, on the Goddard principle of a succession of impulses, etc.

The CHAIRMAN. I would like to have Gen. Mitchell proceed along the line he was pursuing touching torpedoes.

Gen. MITCHELL. That the Navy has?

The CHAIRMAN. In regard to torpedoes. I want to know whether or not they could be used from flying machines. That is what I am interested in.

Gen. MITCHELL. We do not consider them suitable as at present constructed, nor do we consider the airplane that is being used suitable for them.

Mr. PADGETT. You suggested awhile ago, or remarked incidentally, that a corps of aviation could never be a success in the War Department?

Gen. MITCHELL. Yes, sir.

Mr. PADGETT. Do I understand, then, that you want a department of aeronautics?

Gen. MITCHELL. Yes, sir.

Mr. PADGETT. You want a department of aeronautics created outside of and independent of the War Department?

Gen. MITCHELL. Yes, sir; that is correct.

Mr. OLIVER. I suggest that you state some reasons why a united air service, in your opinion, would be better?

The CHAIRMAN. I hope you will. We are developing in the Navy what is known as the torpedo air service. Here is a high authority, and I would like to have his opinion some time before he closes his statement as to whether or not it is feasible to discharge these torpedoes effectively from airplanes at ships.

Gen. MITCHELL. I think that the present Navy torpedo is a very inefficient weapon to use from airplanes for the reason that for the total weight, you carry only 20 per cent of explosive. You have to come down to within 20 feet of the water to launch it, where you will be exposed to the pursuit ships and exposed to every attack possible from anti-aircraft armament on the same plane. You are confined practically to the surface of the water for the purpose of launching this torpedo. We believe furthermore that the same weight carried in explosive bombs, which hit within 60 feet of any ship, will cause very much more damage. The advantage of a torpedo is in putting it in actual contact, below the water line, with the object that you desire to attack. The difficulty of using the water torpedo, its slow speed and its relative small charge of explosive, are limiting factors. We believe we will get more out of explosive bombs, but that is a matter that must be tried and proved, and we want to do it just as soon as we can. Our opinion of a water torpedo is not high. An air torpedo is a different proposition, one that is impelled in a horizontal direction through the air.

We know we can carry great weights with it, and we can precipitate it on a ship at high velocity anywhere above the water and probably under the water for attacking under the bottom. That is a matter of development. We must develop weapons for use from the air as distinguished from use on the water or on the ground; there is very little similarity between the two, and if you do not coordinate all of these air matters under a single direction for a specific object, you are not going to get proper developments, because Tom, Dick, and Harry are using them. The trouble is that we do not like to see things destroyed that we have been brought up to revere and protect; that is human nature and it is nobody's fault. The battleship is looked on all over the world by all the navies as being the thing that must be glorified. We think we can destroy it; it is our business to attack it, and it is up to you to judge whether we can do it or not. We know we can develop air forces at a comparatively small cost. Our biggest bombs cost about \$800 or \$900. as against \$1,800 for the cannon projectiles and loads.

Mr. PADGETT. I understand that you want to use the bomb instead of the torpedo.

Gen. MITCHELL. We want to use the bomb, the aerial torpedo, chemical weapons, gun fire, mines, everything in their proper place. To-day the only things that can successfully attack these armored

ships are bombs developed for use over the land—possibly the fish torpedo. But we have got to develop all these weapons for air use; we have got to look ahead, see what we have to attack, develop the weapons, and do it quickly. Otherwise we will get behind still further.

Mr. PADGETT. I wanted to find out whether it was your idea that these developments would be along the line of bombs rather than along the line of torpedoes.

Gen. MITCHELL. At present we believe the explosive bomb has an advantage over the torpedo and over the gas bomb for the attack of armored vessels, because we can carry more explosives and we can make more hits with them. At present the speed of a ship in the water is almost as great as one of these fish torpedoes.

JOINT MANEUVERS.

Mr. BRITTEN. Have you ever attempted to maneuver with the Navy?

Gen. MITCHELL. We fly over them a great deal in various simulated attacks, and also against various kinds of shipping. But we have never had any joint maneuvers. I brought it up on the 3d of April, 1919, in a very nice and interesting meeting I had with the General Board of the Navy, at which Admiral Badger was presiding. I suggested that we have joint maneuvers on the proposition and work these things out, but we have not been able to do it.

Mr. BRITTEN. What was the board's reply?

Gen. MITCHELL. They were very agreeable and very nice. Admiral Winterhalter called attention to the fact that these things were very necessary.

Mr. BRITTEN. Why have not the maneuvers progressed?

Gen. MITCHELL. That is a matter over which I have no control.

Mr. BRITTEN. Have you attempted to press it in the meantime?

Gen. MITCHELL. Yes; I have submitted a project on that subject, but on account of the demobilization of the force and cutting down on everything it was not carried into effect.

Mr. BRITTEN. The demobilization of whose force?

Gen. MITCHELL. The demobilization of the Army during the year 1919 and subsequently.

Mr. BRITTEN. The request was made by you at a time when you might have carried the maneuvers into effect, but the subsequent period was not desirable.

Gen. MITCHELL. We have not had any maneuvers with the Navy.

Mr. BRITTEN. Nothing has come to the Navy Department for maneuvers with the Army in connection with these tests?

Admiral COONTZ. No to my knowledge.

Gen. MITCHELL. I do not think anything went from the War Department in that connection.

Mr. BRITTEN. Have you the force with which to carry on these maneuvers?

Gen. MITCHELL. Yes, sir.

Mr. BRITTEN. And men, planes, bombs, etc.?

Gen. MITCHELL. Yes, sir.

Mr. BRITTEN. Then why not make another request?

TURNING OVER OF OBSOLETE NAVAL VESSELS TO ARMY AIR SERVICE
FOR USE AS TARGETS.

Gen. MITCHELL. I sent in a request to the War Department about five days ago that two torpedo-boat destroyers, two supply ships, and a battleship be turned over to us for attack, but we have not heard anything from that.

Mr. BRITTEN. Do you mean that if they were turned over to you that they would retain their regular naval personnel?

Gen. MITCHELL. No, sir; I mean that those boats are to be used for targets for air attack in a similar way that the *Indiana* was used, and in the same way that the *Massachusetts* was used for the Coast Artillery. Without those targets we can not tell exactly what our armament will do, or just how to handle it. It would be the greatest single thing that can be done at once to assist the Air Service.

Mr. BRITTEN. What I had in mind when I suggested those maneuvers was not merely placing a number of ships at your disposal to be used as targets, but that it might be well to have you work together in developing these things.

Gen. MITCHELL. That is what we want to do.

The following are the reasons why naval seacraft should be turned over to the Army Air Service for use as targets:

The Army is charged with the defense of the coast. In the event of war, the Army Air Service would be called on to attack hostile navies or shipping without the cooperation of the Navy, because if a hostile Navy approached our shores our own fleet would have been destroyed or neutralized. Under the present law, the Naval Air Service acts with a fleet, the Army Air Service handles all air operations from shore.

In the development of missiles for aircraft, no actual experience in air attack against seacraft has ever been had. A Navy is composed of both unarmored and armored vessels, and among all the means of air attack we must determine which are the best we have now and what line of development we must follow. For instance, there is no use wasting a large projectile against a destroyer, supply ship, or other unarmored vessels. It may be better to hit in the water near it than directly. Cannon and machine-gun fire delivered in certain ways may be better, as might gas, incendiary bombs (against tank ships), torpedoes, or other projectiles. Our tactical methods must be coordinated to carry on the proper operations to get effect which can only be done against targets of this kind.

The Army has personnel which is experienced in bombing, due to their service in the late war, and also has airplanes expressly designed for the purpose of bombing. These airplanes are capable of carrying greater amounts of explosives than are the Navy airplanes, which, due to the fact that they are equipped with pontoons or boats so that they can land on the water, are much heavier than the corresponding types of Army planes with their light landing gears designed for ground work only.

The obsolete battleship *Massachusetts* was recently turned over to the Coast Artillery of the Army for use as a target, and the Navy has already experimented on the obsolete battleship *Indiana*.

The Army Air Service is only asking that it also be allowed to experiment on obsolete seacraft with a view to perfecting its armament, finding out which weapons are suitable for the various conditions of attack, and developing its tactics for this purpose. Without such a test according to Army Air Service methods, no real test of aircraft can be arrived at. No such indication would exist, for instance, if, in a joint maneuver now with no experience whatsoever, the Army Air Service (under conditions which the Navy would prescribe as to bombing), should be sent 100 miles or more to sea to bomb a target in cooperation with the Navy. This would give the Army Air Service no indication as to its effectiveness, as it would be impossible to ascertain whether the hits were made by the Navy or the Army. As a matter of fact, a fleet remains in harbor at anchor for the greater part of the time, and an air attack under such conditions is as important as any other.

In addition to bombing the seacraft, the Army Air Service desires to ascertain by placing animals on various parts of the ships, the probable effect of gas on the personnel of this ship. It also desires to obtain data as to the effectiveness of blinding the personnel of the ship at night, or even in the daytime, by the use of powerful parachute flares. This is important, for if effective, the personnel of the ship would be unable to see the airplanes, while the ship will stand out plainly as a target, due to the illuminating effect of the flares. This would mean that the aircraft would have an easy target while the personnel aboard the ship would be unable to locate anything in the air at all, which would permit aircraft, both lighter and heavier than air, to fly at extremely low altitudes while dropping their missiles.

The Army is specifically charged with carrying out attacks against shipping from shore airdromes. Cannon have been used in war and peace for 500 years. Give the air a chance to develop and demonstrate what it can do.

UNITED AIR SERVICE.

The CHAIRMAN. Will you please take up the subject to which Mr. Oliver directed your attention, a unified service?

Gen. MITCHELL. The mission of aviation, no matter where it is, is identical; that is to say, to destroy, first, a hostile air force and then attack the ships on the water and the Army on the land. Second, you have got to have training in the air as distinguished from training on the ground or on the water, because offensive aviation is essentially an air matter. Third, you will have the same kind of aviation on land and water except in so far as observation airplanes are concerned, which consist of not over 20 per cent of your total force. Of course, you will very materially cut the overhead that is required in these various services by having a common service. Next, your morale will be greatly improved, and all commercial and civil aviation coordinated. We hear a great deal about duplication, and all that sort of thing, and the lack of duplication; we can show you right straight through where there is duplication. Here is an evidence of duplication that I made up last year on one of the estimates. Each estimate, of course, changes the amount of duplication, and I am just using this as an example.

(A) COAST DEFENSE.

1. The following amounts would be saved in the cost of maintaining an efficient coast defense aviation by consolidating the Army and Navy services. This saving would result from the reduction in the number of stations which would be maintained by the Army and Navy, respectively, should they operate separately.

2. The Navy have and are projecting a system of stations on the coast designed for the purpose of maintaining coast patrol with flying boats and seaplanes and providing bases for the aviation units assigned to the fleet.

3. The Army are maintaining and projecting, with money already appropriated by Congress in the fortifications bill, a system of stations designed for the purposes of protecting the principal cities from attacks by hostile aviation, regulating the fire of the coast defenses, and making such surveillance patrols as would be needed by the Army commander.

4. It will be possible to operate both land and water planes from the Army stations, but it will not be possible to operate land planes from the Navy stations. Due to this fact, in a combination of the services, it would seem advisable to eliminate many of the Navy stations, because they do not as a rule provide for the operation of land planes, whereas the activities now being carried on at certain naval stations can just as well be carried on from the Army stations with the consequent reduction in overhead. The following Navy stations may be eliminated or consolidated with respective Army stations indicated below:

Navy.—Rockaway; Yorktown; Hampton Roads; Coco Solo, Canal Zone; Anacostia, D. C.; New London, Conn.; Dutch Flats, Calif.; Boston, Mass.; Narragansett Bay, Portsmouth, N. H.; Hawaii; Philadelphia Aircraft Factory.

Army.—Newdorp, Staten Island; Langley Field; France Field, Canal Zone; Bolling Field, D. C.; Stonington, Conn.; Rockwell Field, Calif.; Weymouth, Mass.; Kingston, R. I.; Portland, Me.; Ford Island, Hawaii; Army factories and experimental stations.

5. The details of the amounts saved on the above stations follows:

Stations.	Maintenance and repair of equipment.	Maintenance and repair buildings and grounds.	Additional construction at stations.	Saving due to reduction in personnel necessary to operate. ¹
Rockaway.....	\$155,000	\$60,000	\$184,000	\$282,000
Yorktown.....	10,000	10,000	25,000	60,000
Hampton Roads.....	272,000	110,000	475,000	402,000
Coco Solo.....	115,000	20,000	.....	170,000
Anacostia.....	62,000	18,000	.....	105,000
New London, Conn.....	2,600	5,000	37,000	\$ 33,000
Dutch Flats.....	106,000	.....	214,000	\$ 276,000
Boston.....	3,200	5,000	214,000	\$ 33,000
Narragansett Bay.....	1,300	10,000	120,000	\$ 33,000
Philadelphia.....	\$ 220,000	\$ 125,000	110,000	.....
Portsmouth.....	1,300	5,000	.....	\$ 33,000
Hawaii.....	.....	.....	1,000,000	\$ 132,000
West Coast Dirigible Station.....	.....	.....	2,775,000	.....
	948,400	368,000	5,154,000	1,559,000

¹ In arriving at the saving indicated, an average cost of \$1,200 for pay, food, and clothing of enlisted men has been used, and an average pay of \$3,000 for officers. Further, only the number of men which would be saved by a consolidation is used as a basis—not the number of men which would probably be assigned to the Navy station, which in most cases is at least double the amount used in arriving at the figures in the above total.

² No estimate of the number of men probably assigned to these stations by the Navy has been obtained. The figures are based on the least possible number which could accomplish the work planned.

³ The estimate expenses on maintenance and equipment at Philadelphia are \$440,000. It is figured that only half of these expenses would be eliminated, and accordingly only \$220,000 has been entered above.

(B) EXPERIMENTAL.

1. Both the Army and Navy are maintaining and continuing experiments. So long as these experiments are for separate services it is difficult to eliminate duplication; but by a combination of services the following duplication may be eliminated:

(a) Investigation of materials used for construction of aircraft.....	\$1,000,000
(b) Development of aviation instruments (50 per cent saving).....	50,000
(c) Investigation of material used in construction of engines.....	167,000

(d) Development of engines.....	\$500,000
(e) Development of aircraft (50 per cent saving).....	750,000
(f) Miscellaneous experiments at air stations.....	137,000
Total.....	2,604,000

(C) AVIATION SCHOOLS.

1. In the operation of aviation schools there has already been an elimination of duplication by the Army undertaking to train the Navy pilots in the operation of land machines; due to this elimination, \$500,000 was struck out of the naval estimates by the Joint Army and Navy Board. This figure is merely a tentative figure, however, as the amount of saving involved depends to such a great extent upon the extent of the program considered.

(D) GENERAL OVERHEAD.

1. It is rather difficult to estimate the actual saving which would result in the combination of operation, production, supply, and general maintenance of equipment by consolidation of the services, due to the fact that no definite program has been approved for either service, and the percentage of saving on the above items depends upon the size of the respective services considered.

2. Based on the size of the present services, there would be a 10 per cent saving in operation, due to decrease in the personnel needed to accomplish the given result which would be obtained by the greater flexibility in assignment.

3. A 50 per cent saving would be obtained in overhead necessary to oversee production of equipment. A 5 per cent saving would probably result due to the placing of consolidated contracts.

4. Probably 20 per cent saving would be secured in the cost of furnishing supplies, due to decrease in operating personnel, size of stocks necessary to be carried, etc.

5. Very little saving in maintenance and equipment would result due to consolidation of the present establishments, except as obtained by the consolidation of stations; but with extended operation of land planes by the Navy there would be at least 20 per cent saving in the maintenance of equipment.

Total, coast defense:

Maintenance and repair of equipment.....	\$953,700
Maintenance and repair buildings and grounds.....	373,000
Additional construction at stations.....	5,249,500
Saving due to reduction in personnel necessary to operate.....	1,625,000
Total.....	8,201,200
Total experimental.....	2,604,000
Total aviation schools.....	500,000

Grand total.....	11,305,200
Operating personnel (present establishments)..... per cent..	10
Procurement and production..... do.....	50
Supplies..... do.....	20
Maintenance and equipment..... do.....	20
Maintenance of airdromes and ground organization throughout United States and overseas possessions..... per cent..	50
Combined meteorological organization..... do.....	50
Combined radio and communication organization..... do.....	50

The increase in the efficiency of a well-trained personnel for handling an air service can not be calculated, but would result in a great saving. This would be accomplished by a united air service.

In addition, the following Government and civil agencies are concerned more or less with aeronautics, which lead to increased expense and considerable confusion in all aeronautical work:

GOVERNMENT AGENCIES COOPERATING IN AERONAUTICS.

Aeronautical board, Washington.
 Army Air Service experimental laboratory, Dayton.
 Bureau of Entomology, Washington.
 Bureau of Fisheries, Washington.
 Bureau of Mines, Washington.
 Bureau of Standards, Washington.
 Forest Products Laboratory, Madison, Wis.

Forest Service, Washington.
 Interdepartmental Board on Commercial Aviation.
 International Aircraft Standards Board.
 Joint Board, Washington.
 National Advisory Committee for Aeronautics, Washington.
 National Research Council, Washington.
 Navy Aerodynamic Laboratory, Washington.
 Post Office Department, Washington.
 Weather Bureau (Washington and principal cities).

CIVIL AGENCIES COOPERATING IN AERONAUTICS.

Curtiss Engineering Corporation.
 Leland Stanford, Jr., University.
 Massachusetts Institute of Technology.
 Throop Institute of Technology.
 Washington State University.

We will use the same organizations that we have to-day for all the auxiliary things. Take, for instance, the Medical Department. We have a medical organization that is capable of handling a united force, and it is in place to-day; we have our doctors; they go in the air with us; we have our regular system of flying surgeons, our regular system of examination of our personnel and physical research about them. I want to say that, of the officers admitted into the Army, 25 per cent, between 20 and 30 years of age, can not pass our aviation examination; after 30 years, 50 per cent, and, after 40 years, probably 75 per cent can not pass them.

The CHAIRMAN. You are referring to officers?

Gen. MITCHELL. Yes, sir; they can not come up to the physical requirements; it is an entirely different proposition in the air than on the ground. We have in existence to-day an aircraft armament section that can take over this question of armament that I have been speaking of immediately and go right ahead with it.

Mr. BRITTEN. You do not want to obliterate the Medical Corps of the Navy, do you?

Gen. MITCHELL. I am not talking about the Medical Corps of the Navy, but am talking about the medical corps of a united air force, which can be made up primarily by transfer of officers from the Army and Navy medical branches in numbers equal to those now on the work.

Mr. BRITTEN. But you referred to the duplication of work and inferred that the Navy had its Medical Corps and the Army had its Medical Corps, and that the Army Medical Corps would do all of this business. Are you still going to need the Navy Medical Corps?

Gen. MITCHELL. I said the medical force on duty with the Air Service; I said we had it and would not require any more. The same thing is true as to armament; we have the armament personnel, both in and out of the Air Service, which is capable of developing the armament; the Navy also have officers engaged on armament work; one outfit can do it. We have the same thing with respect to radio, and with respect to photography. We have a purchasing organization now which could do the work. Therefore, the present overhead can be cut in half at least, and, as all matters will be handled directly, there will be many less hands for air matters to go through.

Mr. BRITTEN. Instead of having two sections, as at present, one operating with the Army and one operating with the Navy, you would have a third one, one with the Navy, one with the Army, and one with the united Air Service?

Gen. MITCHELL. You would have one, because they would all be supplied from a central reservoir. It would be just the same as assigning marines, we will say, for duty with the Army, or as when we had the naval heavy artillery on the front in the European war, but you will have officers whose business it is to go into the air. That is the most essential thing about the whole proposition, because there is more unity of feeling between people in the air than in any other service. In the first place, it is a developing and interesting service; in the second place, it is a more dangerous service, and it requires officers of unusual physique and alertness. Those are the principal reasons for a united air force. It will reduce your overhead about 30 per cent in cost. We believe that, if you will give us the same amount of money that you have laid aside for aviation this year, which is \$100,000,000, that we can develop an air force within three years that will be as good as any other air force, and better, because the inventive genius in this country is superior to that in European countries if it is kept up. With that amount of money, we can secure an air force of about the same size of the one in France, and keep it up, as against the little or nothing that we have now. It will then be a great national asset for war and peace. The following is a rough estimate of the moneys set aside last year for aeronautics:

(a) Under Army appropriations we find the following:

Air Service—

Maintenance and operation..... \$33,000,000

Appropriation is to be expended as follows—

Experimental and research work..... \$5,250,000

Production and purchase of new airplanes
and equipment..... 6,000,000

Claims..... 150,000

For establishment of buildings and improve-
ments at stations..... 245,000

For purchase of Selfridge Field..... 190,000

Military surveys and maps..... 100,000

Bureau of Steam Engineering radio shore stations..... 20,000

Increase for aviation Signal Corps, 1918 (closing up old con-
tracts and claims)..... 24,465,187

For pay allowances, etc., of personnel of the Army Air
Service..... 25,360,000

Estimated on 1,540 officers, at \$4,000..... \$6,160,000

16,000 enlisted men, at \$1,200..... 19,200,000

Proportionate part of appropriation for the subsistence of the
Army based on 16,000 enlisted men in relation to 280,000.

The proportionate part of \$32,000,000..... 1,830,000

(b) Naval Aviation:

Procurement, production, operation and maintenance..... 20,000,000

Appropriation to be expended as follows—

Necessary aircraft..... \$3,883,400

Necessary equipment..... 300,000

To continue construction of 1 airship (authorized) 1,500,000

New construction at stations..... 4,962,000

New equipment for training..... 100,000

Maintenance of plants and overhauling..... 6,044,000

Experiments and development..... 2,935,000

Pay of classified force..... 275,000

Aberdeen Proving Ground, for construction of 1
steel hangar to accommodate 1 United States

Navy C-2 Airship..... 150,000

Expenses of Investigation Committee on estab-
lishment of aviation bases at Sand Point, Wash.,
and Port Angeles..... 50,000

Pay allowances, etc., of Navy personnel..... 8,000,000

Estimated on 500 officers, at \$4,000..... \$2,000,000

Estimated on 5,000 enlisted men, at \$1,200..... 6,000,000

(c) Post office:	
To purchase airplanes and maintain aerial mail service.....	\$1, 250, 000
Alaska mail route (subject to disposal of Postmaster General).....	255, 000
To establish new aerial mail routes at discretion of Postmaster General.....	1, 250, 000
(d) Fortification for sea-coast defenses, installation of searchlights, and replacements, including those for antiaircraft defenses.....	
Air Service station, Hawaii.....	566, 250
Air Service station, Panama.....	1, 300, 000
Air Service station, insular possessions.....	239, 100
	302, 046
(e) Forest patrol:	
Fighting and preventing forest fires.....	} 50, 000
Maintenance of air patrol.....	
(f) Miscellaneous:	
National Advisory Committee for Aeronautics.....	200, 000
Bureau of Standards, for investigation of standardization of methods and instruments employed in radio communication.....	30, 000
To develop methods of testing and standardizing motors, tools, and instruments in response to the requirements of aeronautics.....	15, 000
Officers to take aeronautical engineering at colleges and universities, and for textbooks necessary therefor.....	Unexpended.
Government Printing Office.....	50, 000
War Department.....	\$250, 000
Navy Department.....	250, 000
(g) General Army appropriation:	
Proportionate part of all appropriations for regular supplies of \$28,000,000, based on 16,000 enlisted men, as compared with 280,000 for the whole Army.....	1, 600, 000
Incidental expenses, based on same proportion.....	357, 000
For development, manufacture, and purchase of airplane bombs and for development, test, manufacture, and purchase of sighting devices for bombs.....	1, 000, 000
For small-arms target practice.....	28, 600
Total.....	121, 168, 183

What are we getting out of it now? If we had the same amount lumped under one force, we could use from \$25,000,000 to \$45,000,000, or the cost of one battleship, per year in the building of airplanes for our national defense, and after three years of that expenditure you would give us a dominant air force in this country for just what you are spending now.

Mr. BRITTEN. In other words, we have no policy now?

Gen. MITCHELL. We have no air policy. Our air doctrine should be to find the hostile air force, concentrate against it, and whip it; our policy should be to have a sufficient air force to be able to accomplish that, and our method of carrying it out should be to distribute this force in the most economical manner we can throughout the country. We recommend one-fifth under the colors only; no more people than you have in the various services to-day—in fact, less—and the rest of it in the reserves. These reserves can be organized to mobilize at once, because the air force is the first arm that will fight in a future war.

The CHAIRMAN. You are a part of the Army?

Gen. MITCHELL. Yes, sir.

The CHAIRMAN. Suppose you became a part of the Navy—would there be any conflict of authority?

Gen. MITCHELL. No; not if it is prescribed by law, any more than there is conflict of authority in relation to the marines or anybody else. We would not have any trouble.

Mr. HICKS. To carry your suggestion to its logical conclusion, we might as well do away with the War Department and the Navy Department and consolidate both the War and Navy Departments under one head.

Gen. MITCHELL. That is the logical answer. I think the establishment of a secretary of defense, with subsecretaries of air, Army, and Navy under him, would be the logical thing to do, but, with political conditions the way they are now, I do not believe you would carry that into effect.

Mr. HICKS. You think that perhaps you could have some board or commission above the War and Navy Departments which would make them coordinate and come together?

Gen. MITCHELL. Not a board—a definite Cabinet member who can be held responsible for the development of aeronautics. No board handling aviation has ever worked satisfactorily and none ever will.

Mr. BRITTEN. What about the Commander in Chief of the Army and the Navy? Does he not occupy about the position you have suggested?

Gen. MITCHELL. I did not quite catch your question.

Mr. BRITTEN. The President of the United States is the Commander in Chief of the Army and the Navy.

Gen. MITCHELL. Yes, sir.

Mr. BRITTEN. Why not let him assume the authority of minister of war?

Gen. MITCHELL. That is the theory of our Government, but he is always so busy that the authority must be delegated to some other place. We are not theorizing on this air organization; we have been at it a good many years, and have had lots of experience at it. As I pointed out before, we have always had this same opposition, from the Navy and Army, and the result has been the same—an inefficient air force. The same opposition was manifested in England that is manifested here now to the creation of an air force.

Mr. BRITTEN. I think you are basing all of your conclusions on theory and not on fact.

Gen. MITCHELL. No, sir; we are basing them on fact.

Mr. BRITTEN. You are basing them on theory because you say you hope this or that can be accomplished with airplanes and you want to try out those very things. Just as Admiral Sims said yesterday, "if" the airplane can do certain things we can accomplish certain results.

Gen. MITCHELL. In my testimony, you will notice that I have made a distinction between two things. I have told you what it can do, and I have told you what we think it can do.

Mr. BRITTEN. That is theory?

Gen. MITCHELL. No, sir; it is more than theory.

Mr. BRITTEN. It certainly is not fact.

Gen. MITCHELL. It is fact as far as control of the air is concerned, as far as the attack of troops on the ground is concerned, and it is practically a fact as far as unarmored ships are concerned. The attack of armored ships needs development, and it is a fact that a united air service under air officers will be more efficient than as a secondary branch of the Army or Navy.

Mr. OLIVER. If it is not a fact now, how do you expect it ever to be a fact, unless you permit experimentation with the theory?

Mr. BRITTEN. I want him to experiment, and I am for that very experimentation. I want him to maneuver with the Navy and make these theories effective.

Gen. MITCHELL. We want to be allowed to develop along air lines until we convince you that the air force is the national asset that all the other great nations know.

The CHAIRMAN. I am the pioneer; I asked questions along that line yesterday, and they seemed to create a great deal of amusement. We want you to experiment and the Navy to experiment; we want you to take bombs and torpedoes and practice on these old ships, because some of them will be more useful to us blown up than they are now.

Mr. OLIVER. From the information you have, you have great faith in the outcome of aviation and as to what it can accomplish, and you feel that only those having such faith in it and who are enthusiastic about it should be placed in control of it?

Gen. MITCHELL. Yes, sir.

Mr. OLIVER. In other words, you do not feel that the best results will follow, unless those directing the activities of the Air Service are men wholly in sympathy with it and who have faith in its possibilities, and wish it to succeed?

Gen. MITCHELL. We know it; we do not think so. Every flying officer you see here to-day is perfectly willing to let a battleship put any amount of antiaircraft material on it and then go out and attack it with bombs. That is how they feel about it—every one of them. They would not be in this dangerous service unless they were convinced of its possibilities.

Mr. OLIVER. With our Air Services organized as they are at present, both in Army and Navy, you feel that you can not get the best results?

Gen. MITCHELL. We know we will not; we know it. It has been so in the past, is so now, and will be so in the future.

The demands of the late war have so hastened the development of aircraft and their uses that the following unusual condition exists as the present time, namely: In the pilots and airplanes existing as a result of war the United States possesses a considerable body of trained personnel and considerable equipment of a highly specialized nature, and there is no developed commercial and civil demand for this personnel and equipment.

This condition is due to the fact that aviation development for military purposes has been highly forced, abnormal, and unnatural. One of the unfortunate conditions has been that all countries engaged in the development and manufacture of aircraft have also been engaged in the war. The military development has therefore been carried to a high state of efficiency, while the commercial development remains practically at the same stage that it occupied in 1914.

As a result of these conditions, one of three things may be expected to occur in the United States with reference to the commercial uses of aircraft: First, the intelligent and systematic fostering and guiding of commercial development and uses through governmental aid and supervision. By this method a great portion of the valuable experience obtained during the war will be utilized. Second, the development of commercial uses of aircraft entirely as a commercial "dividend paying" business by commercial firms. This method will

result in very slow progress, will be expensive, and during the readjustment period following the war no advancement will ensue. The rate of progress will be entirely dependent upon the financial returns and will be extremely slow during the first two or three years. Third, by following and imitating the development made by more progressive people. This method at the present time appears as if it might result in, within a few years, a condition with regard to aerial transportation as existed at the beginning of the war with regard to marine transportation.

In addition to the commercial and civil situations outlined above the question of aircraft and their uses as a means of national defense, both military and naval, has become so great that, considered simply as a fighting arm, the employment of aircraft has almost reached, and all indications tend to show that it soon will reach a scale of importance equal to the Army and Navy. The use of aircraft as an auxiliary for military and naval operations was, at the date of the armistice, rapidly approaching a point of secondary importance when compared with the uses and value of aircraft as an independent fighting force.

It is a matter of common knowledge that whenever an organization is made up of two or more parts, each part will be smaller and less important than the whole. This axiom applies particularly to military and naval organizations which should be so proportioned as to obtain the greatest efficiency from the entire organization. Neither the Army nor the Navy, nor both combined can be expected to develop, organize, and perfect aircraft and their employment to the greatest possible limits of which that weapon is capable.

Considered simply as a military and naval weapon, a conservative estimate of its possibilities 10 years from to-day is such that it can be stated that, in case of war in which the United States is engaged, if the enemy obtains the mastery of the air, he will be able to dictate his own peace terms at any place within the United States that he may desire. It is firmly believed that in wars between first-class powers, the victory will be won by that nation which first obtains and holds the mastery of the air. It may be stated that the military development of the airplane to-day has almost reached that state where air supremacy is more vital to national security than naval supremacy.

Warfare to-day between first-class powers includes all the nationals of the nations engaged, men, women, and children. This inclusion of women and children is not merely a sentimental and economic one, but during the last war had become an actual one from the military standpoint. Women and children were part of the military and naval forces, both at home and abroad, and this inclusion did not stop short of the actual firing line. This may be expressed in the statement, "The entire nation is, or should be, considered a combatant force." Therefore, we must expect, in case of war, to have the enemy attempt to destroy any and all of our combatant forces, his attacks being controlled by the dictates of strategy and tactics.

It may often be the best strategy to damage and destroy property and to kill and disable the enemy's forces at points far removed (in miles) from the theater of the ground or naval operations. These forces may be composed largely of women and children and other

members of the nation's industrial and economic armies not capable of bearing arms, but vastly more important as manufacturers of munitions and the thousand other necessities than they would be if actually carrying rifles in the trenches.

The efficient protection against the enemy using aircraft for such "interior" destruction is a function that does not properly apply to either the army or the navy air forces, and is one that, except under the most unusual circumstances, they can not be expected to perform without grave detriment to their own particular duties. Likewise, the employment of aircraft for injuring the enemy at "home" is, or should be, a distinct and separate function, independent (to a great extent, at least) of the conditions and actions controlling the employment of the army and navy proper. The utilization of such a weapon of defense and offense is, at the present time, so important and is becoming more and more so, that adequate preparation must be made by this country as a vital means of defense. Suitable and adequate preparation of this weapon, and of the personnel required to man, manufacture, and supply same, can not be furnished either by the army or navy, nor by the two forces combined. In order that it can be developed to the point where it will represent a real safeguard, it is necessary that an organization be formed whose main functions are the employment of aircraft in all its varied fields of action, military, naval, and commercial.

The importance of this function of the Government is so great and the interested industries are so large in number that the governmental organization for the development, control, and employment of aircraft in its many phases, peace-time, as well as war-time, require the formation of an executive department of the Government, "the department of aeronautics."

LEGISLATION NEEDED.

There should be legislation to establish and authorize a department of aeronautics along the following lines:

(a) There should be established a department of aeronautics with a cabinet officer as the head of same.

(b) This department should be charged, under the direction of the President, with:

1. Development and operation of all Government aircraft.
2. The provision and operation of all Government landing fields, except such as may be assigned for the uses of other departments of the Government.
3. The provision and operation of "aids to navigation," such as beacons, landmarks, etc., throughout the United States and its possessions, for governmental and commercial uses in the same manner that lighthouse establishments provide aids for water navigation.
4. The provision and operation of such experimental laboratories and experimental factories as may be required for the development of, and manufacture of, new and unusual equipment.
5. The provision of funds and other aids in connection with the development of new inventions and the improvement of equipment, both for commercial use as well as governmental use.
6. The provision for war-time control of all phases of activities connected with the employment of aircraft. This especially in connection with the manufacture and to be inclusive of all raw materials as well as semifinished and finished products.
7. The provision for encouraging the civil and commercial manufacture of aeronautical equipment and its employment for commercial uses by means of bonus, subsidy, or other method until the industry has reached the state where it will be self-supporting. At the present time the requirements of national defense warrants this provision.

8. The provision through the Consular Service, or other means for encouraging the growth and development of foreign markets for the output of American aeronautical industries.

9. The provision and promulgation of regulations for the control of aeronautical traffic and the safety measures in connection therewith.

10. The provision of regulations covering the employment of American and foreign aircraft within the territories of the United States.

11. The provision for the development of sources of raw and finished aeronautical materials.

12. The provision for the establishment and operation of an air college for the higher training of staff, executive, and command officers for the Department of Aeronautics, for peace service, for war service, and for the training of such officers as may be necessary from the Army and Navy in connection with the strictly military and naval uses of aircraft.

13. The provision for the collection, compilation, and preservation of census data, personnel, matériel, and industrial, covering the resources of the country with respect to aeronautics for use in national emergency.

14. The provision for governmental assistance by the furnishing of the use of landing fields and other material assistance. Also financial assistance by bonus or subsidy, for the commercial and civil employment of aircraft throughout the country.

Mr. OLIVER. Assuming we authorize a united air service, would that air service detail for service with the Navy, when called on, so many men, and the same with the Army, and would the air service, when operating with the Navy, be under the command of naval officers?

Gen. MITCHELL. Entirely under their command and under their disciplinary regulations. The law should provide that.

Mr. OLIVER. But the planning of airplanes, the production of airplanes, and the training of the Air Service should be under the control, as you believe, of a single air service?

Gen. MITCHELL. Absolutely. All observation work with the Army and the Navy should be developed entirely along the lines of what those services desire and require, but the offensive aviation should be entirely away from it, separate and distinct, so that we can develop it for attacking and destroying navies and armies in addition to air forces.

Mr. OLIVER. Is it important, in order to get efficient results from the personnel of the Air Service—and I am speaking of the commissioned personnel—to allow those men to remain permanently in such service?

Gen. MITCHELL. Absolutely. Every country in Europe now recognizes that.

Mr. OLIVER. If you detail men from the Army or from the Navy to the Air Service for two or three years, without any previous training, and then allow them to go out and new men come in, you can not get efficient results?

Gen. MITCHELL. Never, because they can not learn even to handle organizations in that time, let alone all that is required of the pilot.

Mr. OLIVER. Those are the reasons that strongly appeal to you in suggesting that we have a united air service, as I understand?

Gen. MITCHELL. You can not have an efficient air service as a national force otherwise.

Mr. OLIVER. And you also think it would be economical?

Gen. MITCHELL. Yes, sir; I think you will cut down the overhead pretty nearly 30 per cent.

Mr. OLIVER. And it will likewise greatly add to the morale of the service?

Gen. MITCHELL. It makes all the difference in the world. You can see the difference in the morale of our people since that law went through last summer.

Mr. OLIVER. That is, the law requiring one to be a flyer in order to get a commission?

Gen. MITCHELL. Yes, sir; and making a separate arm of it.

Mr. OLIVER. And only allowing 10 per cent to be nonflyers?

Gen. MITCHELL. We ought not to allow anybody who is not an actual flyer in the regular service.

Mr. OLIVER. The chairman of the committee, myself, and other members of the committee, were very much interested when we had before us the matter of establishing two air services in the Navy, one in the Marine Corps and one in the Navy. I recognized the weakness of it, and that if we are to have men without any experience controlling the Air Service, we will have no real air service?

Gen. MITCHELL. It would be a horrible joke.

The CHAIRMAN. My mind goes along with Gen. Mitchell's to a certain point, and then I seem to separate from him. Do you not think the Navy should have its own Air Service, because of the habits of the sea? I can appreciate that you are not a sailor man; but you are a soldier man.

Gen. MITCHELL. No, sir; I am an air man.

The CHAIRMAN. But you do belong to the Army, do you not?

Gen. MITCHELL. I have a commission in the Army right now, but my business is in the air.

The CHAIRMAN. But the Air Service belongs to the Army?

Gen. MITCHELL. It happens to be attached to the Army, but it really is not an Army force. The only thing you can bring against the proposition of using any members of the Air Service for naval purposes is that when a man becomes a sailor man he is apt to get seasick if he goes to sea, but we could select them for that purpose, men who would not get seasick, and train them for work over the water. That is about all there is to that. At present we train naval officers in several of our schools for various classes of aviation.

The CHAIRMAN. I thoroughly appreciate your great mental activity and you come pretty nearly fitting into the class of people I want to see provided for and given a chance to get something done. It seems to me, Gen. Mitchell, that up to a certain point there might be a consolidation, but when it comes to the accomplishments of the fleet I still have in mind the fact that the big battleship is the unit, the backbone of the Navy, as we call it, although you do not see it that way.

Gen. MITCHELL. I see it that way, but I do not think it is going to be that way very long. The size of an air force with a navy is limited to the number of airplane organizations it can put on carriers. This will be only 300 or 400 planes, and all the rest of the aviation will act together on land. This should be the parent for the aviation with the fleet, and keep it up to top notch. As the air gradually becomes more efficient, the radius of action over the water will constantly increase. Under these conditions the aviation assigned to the fleet will be more efficient than if kept under the Navy Department.

The CHAIRMAN. You would make the Air Service an auxiliary of the fleet?

Gen. MITCHELL. Make it absolutely under the fleet when at sea, as it is under the Army on the land. If the air force is carrying out the principal operation, then put the command in an air officer. On account of the limitations you have in the way of airdromes and in airplane carriers you will be able to use very few airplanes in the Navy as compared to what you can use on land; it is going to be a very small part of the whole for a long time. I can show you, for instance, that the air defense of the Panama Canal should be from Porto Rico; that is where the defense of the Panama Canal should be. This would be entirely an air matter—neither Army or Navy.

Mr. BRITTEN. Do you work as well at night, in rainy weather, and foggy weather as in the sunshine?

Gen. MITCHELL. I wanted to bring that out before I stopped. We can not work well in actual fog, but we can work in rain, in a certain amount of snow, and in hail, with the equipment we have now, and we believe that if you will allow us to develop we can do much better along those lines. We have just established a model airway from Long Island to Langley Field, to Washington, to Moundsville, and to Dayton, so that we can use all of this direction finding by wireless, all of these navigating instruments for fog and rain flying, and keep using them all the time. In that way we believe we can overcome the fog end of it.

Mr. BRITTEN. Do you really think you could prevent ships from going to South America at night?

Gen. MITCHELL. Night is easier than the day, Mr. Britten, and that is why birds fly mostly at night, the migratory birds; the visibility is better. Most of the nights are clear. There are some tropical storms that come up, but we could go across that place in three hours or so.

In closing, I wish to invite attention to the fact that the one new element that was injected into and developed during the war was the air force. Air power in its relation to sea power and land power is beginning to be well understood. Those who see its imperative necessity are forging ahead in its development. Let us therefore place its development where it can be accomplished in the most efficient and economical manner possible, in a department of the air, with a secretary who can be held absolutely responsible for its proper development. Surely we have learned some lessons from this great war. Let the Army be organized to fight on land. Let the Navy be organized to fight on the water. Let the air force be organized to fight in the air, which covers both the land and the water.

SUGGESTED MODIFICATIONS OF THE NAVAL BUILDING PROGRAM TO PROVIDE FOR AIRPLANE CARRIERS.

Mr. OLIVER. I want to make a motion that this committee report a bill providing for the construction of two airplane carriers of the most modern type, to cost not exceeding \$28,000,000 each, and that, pending the securing of an appropriation for that purpose, no further money be expended in securing material for or for work on the battleships *Massachusetts* and *Iowa*.

The CHAIRMAN. Does that mean the conversion of those two ships into airplane carriers?

Mr. OLIVER. No; it does not mean their conversion, but pending the securing of an appropriation for the airplane carriers, I would provide that no further money should be spent or work done on those two battleships.

Mr. HICKS. All of us realize the importance of this matter, and I suggest that we have a subcommittee appointed to take up this matter and report back to the full committee in reference to these airplane carriers. I make that motion.

Mr. BRITTEN. I was going to offer a substitute motion that the 12 destroyers, included in the 1916 program, to cost not exceeding \$24,000,000, and for which \$24,000,000 was appropriated; one transport, to cost \$4,000,000; the six fleet submarines to cost \$24,000,000, totaling \$52,000,000 worth of construction that has not yet been contracted for, and upon which not one dollar has been expended in the drawing of plans, be suspended. I am going to move at the proper time that this money, amounting to practically \$52,000,000, be made immediately available for the construction of two airplane carriers.

(Thereupon, at 12.15 o'clock p. m., the committee adjourned until Monday, February 7, 1921.)

Monday, February 7, 1921.

The committee being in session, Hon. Thomas S. Butler, chairman, presiding, the discussion of the naval policy and the naval building program of the United States was taken up.

Present as witnesses: Admiral R. E. Coontz, Chief of Naval Operations; Capt. T. T. Craven, Director of Naval Aviation; and Rear Admiral David W. Taylor, Chief of Bureau of Construction and Repair.

The CHAIRMAN. Mr. Hicks wants to ask Admiral Coontz some questions.

Statement of ADMIRAL ROBERT E. COONTZ, Chief of Naval Operations, accompanied by CAPT. T. T. CRAVEN, Director of Naval Aviation.

Mr. HICKS. Admiral Coontz, you have been listening for the last two or three days to statements in regard to the need of an airplane carrier or carriers for the United States Navy. You are familiar with the arguments that have been advanced as to the military need of such vessels. Will you give us your opinion as to whether or not you think we should have these airplane carriers at once, and if so, how many, and also tell us whether or not, in your opinion, we could dispense with the completion of some of our present naval program?

Admiral COONTZ. Mr. Chairman, I would like, with your permission, for a couple of minutes before answering Mr. Hicks's question to talk about some of the things I have heard here.

AIR-BOMBING EXPERIMENTS ON THE U. S. S. "INDIANA."

In the first place, I would like to say that the Navy made the experiment on the *Indiana*. Every experiment we make is open to

this committee, and we want to give you all the information we have in regard to that matter. When that experiment on the *Indiana* was made, information about it was sent to the War Department confidentially and it got out. The Navy to-day is experimenting on both coasts on a torpedo plane, and any time you want to call on us for information of that kind we will be glad to give it to you. The Navy proposes within the next 90 days to bomb a battleship out in the open sea. We are not slow on these things. We are not asleep. When we get information we will be glad to give it to you. We want to make an experiment on a more modern ship than the *Indiana*. All of those things are coming to pass, and the experiments are going on all the time. Experiments with bombs as to what happens when they are dropped, as to atmospheric disturbances, as to what effect there would be on the deck of a modern ship, and all those things we are working on. I simply tell you that to show that the Navy has those things under consideration all the time.

THE BUILDING PROGRAM—NEED FOR AIRPLANE CARRIERS.

I have heard various talk within the past three days. The consensus of views, as far as I can find out, is that the battleship is still paramount, and they are still the backbone. There is a possibility that aviation and airplanes will work wonders in the future, just as wonders have been worked with the submarine and with the destroyer. But they have not put the battleship out of commission yet. Every time a new device comes out we find something to accompany the battleship and defeat it. With the battleship we must have airplanes just the same as we have to have all the rest of the things that go with the battleship. We must be able to carry them all to sea with us. We have to manipulate the airplanes from a base on shore or from a floating carrier. We asked for one first in 1915; we asked for it again in 1918. We asked for it in 1919 when we got the *Langley*, a 14-knotter, to make a trial, and we want a 32 or a 35-knotter, if we can get it. So I say the most urgent thing that the Navy needs is two airplane carriers, one for the Atlantic and one for the Pacific. Let us give up the six seagoing submarines, if necessary; let us get the transport somewhere else; we need them, but we do not need them as badly as we need the airplane carriers. Let us not complete the other 12 destroyers; we do not need them now. There is \$58,000,000 (with armor).

The CHAIRMAN. Has that been appropriated?

Admiral COONTZ. It was in the 1916 bill, all of it. It has not been appropriated; it has been authorized. But, gentlemen we could have given the contract for those ships any day.

The CHAIRMAN. You could award them tomorrow, if you wanted to?

Admiral COONTZ. Yes. But we have not done that. The Secretary of the Navy, in view of the urgency of this matter has directed us to stop that, so we ask you to give us those two carriers, and we will build them within the next two and one-half years.

Mr. HICKS. Assuming that in the judgment of this committee or of Congress it might be better instead of doing as you suggest about the 19 ships that have only been authorized, to slow down on one

or two of the battleships with a view of adopting another type. Do you think, in case we find it not prohibitive as to expense, we could get down say to 8 battleships and provide the fleet with two carriers in their place? Would that be advisable from a military standpoint in your judgment?

Admiral COONTZ. No, sir.

Mr. HICKS. Why not?

Admiral COONTZ. Because, Mr. Hicks, in 1916 we at last got started so that we could secure a Navy of some importance and equality. We had waited all our lives. Now the propaganda comes to stop it. But I say let us not do that. We are getting toward the point where we will have an adequate Navy, and I would not stop the building of a battleship or a battle cruiser until we are in that condition, and then it will be time to talk disarmament.

Mr. HICKS. In your judgment, which will have the greatest striking force, these 10 battleships we are now building, or 8 of those battleships plus 2 of the airplane carriers that are suggested?

Admiral COONTZ. Mr. Hicks, the question, to my mind, is one that is impossible to answer. No battleship should ever go out to sea for battle unless it has airplanes with it. With the battleships are the submarines and the destroyers. They go after the airplane carrier all the time and try to destroy it. Suppose we had 10 battleships, and there was a certain number on the other side. The air forces would contest for supremacy and one of them would prevail. Then the nation that has battleships and air forces left still has control of the sea.

Mr. HICKS. That is true. You evidently give to aviation a very high place, and there must be somewhere in your mind an assessed valuation of aviation as against battleships. How would you assess the Air Service which, of course, I know is a very problematical matter?

Admiral COONTZ. I can not go anywhere near as high as some of these gentlemen have at the present time, because they have not proven their case. I might give it 20 per cent, but no more at the present time.

Mr. BRITTEN. Is not that a rank guess?

Admiral COONTZ. It is an absolutely foolish guess. Nobody knows. We want to find out.

Mr. BRITTEN. It would depend entirely on the surrounding elements, would it not? Suppose you torpedoed one of their airplane carriers.

Admiral COONTZ. Then, it goes down. We wanted to give you a moving-picture show this morning which would show the airplane carrier we have, with the airplane landed on its deck, and show the torpedo plane at work.

That is all I have to say about those two carriers. I would like to have Admiral Taylor make a statement showing what we can do with the money, what kind of carriers we can build. We do know that the other nations have certain of these carriers.

Mr. HICKS. You feel of course that they should be very fast? They should be of large size and of large capacity, also, I think?

Admiral COONTZ. I feel they should be very fast and should carry at least 80 planes, and they should not be wider than the Panama Canal, because I do not believe in the collapsible vessel. The air-

plane carriers should have on them every modern improvement we could put on them.

Mr. HICKS. Admiral, do you think it would be possible to convert the *Leviathan*, for instance, into an airplane carrier which would be practicable and worth while?

Admiral COONTZ. No, sir; I believe it would be a makeshift. While we are about it we might as well have something good or nothing.

Mr. BRITTEN. The speed of the *Leviathan* is very inadequate!

Admiral COONTZ. Yes; and the cost of converting that ship would be a vast amount.

The CHAIRMAN. Admiral Coontz, the time is short; the naval appropriation bill will go through the House this week, in my judgment, and I do not want to vote for any additional ships of war at this session.

Mr. HICKS. If we take up the proposition of canceling the 2 battleships and building 2 carriers in their place, we will not be spending any more money, eventually, by having 2 carriers and 8 battleships instead of the 10 battleships.

Admiral COONTZ. We want 10 battleships so we can have a properly balanced Navy.

Mr. HICKS. The only question is whether or not 8 battleships and 2 airplane carriers would not be more effective and more efficient than 10 battleships?

Admiral COONTZ. No.

Mr. HICKS. You think not?

Admiral COONTZ. I think not.

Mr. PADGETT. You think 10 battleships and 2 carriers would be worth more than 8 battleships and 2 carriers?

Admiral COONTZ. If we get those two carriers. If we do get them, our minds for the present will rest easy, but until we do get them our minds are not easy. It has been shown that we do need them, and they will come. If we do not get them now, we will get them later. But now is the time we should have them in order to round out the Navy. All these other propositions have been withdrawn.

Mr. HICKS. Admiral, while this is out of your bureau, I would like to ask how long will it take to build the carriers?

Admiral COONTZ. From 2 years to 30 months for the big ones.

Mr. OLIVER. As I understand it, you and the General Board more than a year ago impressed upon the committee the importance of building these carriers at once?

Admiral COONTZ. Yes, sir.

Mr. OLIVER. And you are still of that opinion?

Admiral COONTZ. We are still of that opinion unanimously.

Mr. OLIVER. And so important is the matter that you feel free to say to the committee that if war should come and we had no carriers and our enemy had carriers there would be great embarrassment, if we sent out the dreadnaughts?

Admiral COONTZ. We would be greatly embarrassed.

Mr. PADGETT. The logic of your position is to go ahead with the battleships, which are still the backbone of the Navy, and add to them the two carriers?

Admiral COONTZ. Yes, sir.

Mr. HICKS. Is it not a fact that the question of a carrier is still more or less in an experimental stage? I do not mean the necessity for them, but their physical features. We do not really know enough about their needs to warrant us in building four carriers at the present time, do we?

Admiral COONTZ. Well, Mr. Hicks, I hold that we do know enough about them to warrant us in building them.

Mr. HICKS. What planes would you put in them? We have not developed a type suitable, have we? We do not know what kind of planes are needed, I am afraid.

Admiral COONTZ. I will leave it to Capt. Craven to tell you what kind of planes are needed; but it is not going to take us long to fix up a carrier which will carry almost any kind of plane we do need, and have those planes land on it; but if we keep on as we are we are still in the same fix. The other people are building them. They know what kind they can carry on them, and we can find out.

Mr. HICKS. Do you think it would be the proper plan to build one carrier now and then experiment with that, and after study then build another one incorporating the lessons we have learned from the first one?

Admiral COONTZ. No, sir. We wasted our time on the *Jupiter*. What we want to do is to find out about our needs in advance of everybody else, and then let the rest of the nations come along.

Mr. HICKS. I am a great believer in these airplane carriers. To me they are absolutely essential, and I would like to see three or four of them in the Navy. But I am confronted with the condition of the Treasury of the United States and the sentiment of Congress, and I do not think there is a possibility, as far as I can see, of the Navy getting two carriers by means of a fresh appropriation of money.

Admiral COONTZ. I still hope you can.

Mr. OLIVER. I think the responsibility should rest on the body that is clothed with the authority, and it should be put up to them.

Admiral COONTZ. We tell you, and we tell Congress that that is our most urgent need.

Mr. HICKS. I believe that is the most important factor, on the whole, at the present time.

Admiral COONTZ. Great Britain has various carriers the contracts for which are under way.

Mr. HICKS. Two of them are modern ships, built especially for airplanes in war, as I understand it. These have speeds of 30 to 31 knots.

Admiral COONTZ. That is my understanding. My understanding also is that Japan is building carriers.

Mr. HICKS. She has several that were converted liners.

Admiral COONTZ. I believe that is the present situation. But the very fact that she is experimenting with them shows what she thinks about it. This is a list of the British carriers, with their displacements and other details:

British airplane carriers.

Ships.	Displacement.	Length.	Beam.	Speed, maximum.	Armament.	Radius of action.	Planes.
Argus.....	<i>Tons.</i> 15,786	<i>Feet.</i> 570	<i>Feet.</i> 68	<i>Knots.</i> 21	4 4-inch A. A.; 2 4-inch antishub.; storage for 60 torpedoes.	4,000 miles at 18 knots.....	20 Sopwith torpedo planes (1,000- pound torpedo) 12 reconnaissance; exact equipment not set- tled.
Pegasus.....	3,300	332	43	20½	2 12-pounders; 2 12-pounders A. A.	Ex-commercial vessel purchased in 1917; fuel capacity 360 tons oil.	4 reconnaissance, 5 fighting planes.
Arkroyal.....	7,450	366	51	11	4 12-pounders.....	Ex-commercial vessel purchased in 1914; carries 500 tons fuel oil.	Carries float seaplane and is fitted with trolleys for launching them.
Furious.....	22,900	786	88	31	Originally designed for 2 18- inch guns; now removed.	Ex-cruiser.....	14 reconnaissance, 6 fighting, 1 1 lighter-than-air craft.
Hermes.....	10,350	533½	(¹) 84	25	10 6-inch, 4 4-inch.....	Carries 2,000 tons fuel oil.....	20.
Eagle.....	26,000	661	(¹) 100	(²) 24	12 6-inch, 4 4-inch, 6 sets 21- inch above-water T. T. S.	Coal, 3,200 tons; oil, 1,750 tons.....	28 2-seaters.
Vindictive.....	12,000	600	62	30	4 7.5-inch, 4 3-inch A. A. gun; 4 3-inch guns, 2 above-water, 21-inch torpedo tubes, 1 below- water, 21-inch torpedo tubes.	80 hours at 26.5 knots.....	10 reconnaissance.

¹ Amidship flying deck.² Flying deck.³ Light, 22½ deep.

**Statement of REAR ADMIRAL DAVID W. TAYLOR, Chief, Bureau
of Construction and Repair.**

**THE BUILDING PROGRAM—CONSTRUCTION OF AIRPLANE CARRIERS—
COST OF VARIOUS TYPES OF VESSELS.**

Mr. HICKS. Admiral Taylor, how much of the 1916 program has been contracted for, and what, in your judgment, will it cost to complete?

Admiral TAYLOR. The number of vessels not contracted for are the 19 vessels that Admiral Coontz spoke about. These are the only vessels of the 1916 program not under contract.

Mr. PADGETT. Bids are out for the six fleet submarines and the transport, but not yet acted upon?

Admiral TAYLOR. There were nine of those fleet submarines, of which we are building three at the Portsmouth yard. Bids for the other six have not yet been acted upon by the Navy Department, and bids for the transport have not yet been acted upon by the Navy Department. No bids have yet been asked for for the 12 destroyers.

Mr. HICKS. How much do you estimate will be the cost for the battleships, complete, authorized under the 1916 program, apiece?

Admiral TAYLOR. Complete?

Mr. HICKS. Yes, sir.

Admiral TAYLOR. I presume you refer to six of the larger size, Mr. Hicks?

Mr. HICKS. Yes, sir.

Admiral TAYLOR. Those 10 battleships include two sizes. For the larger size the estimated cost, including ammunition, is \$43,195,000, and without ammunition, including the hull, machinery, armor and armament, it is \$38,500,000, in round figures.

Mr. HICKS. What is the estimated cost of these carriers that you have in mind, \$28,000,000, complete?

Admiral TAYLOR. We have two types of carriers, as covering the range of possibilities. The cost of the smaller type, which will make 29½ knots, of 25,000 tons displacement, excluding ammunition, is \$21,600,000, and of the larger type, of 35,000 tons displacement, and making a little under 33 knots, the cost is \$28,600,000, in round numbers.

Mr. HICKS. Then, Admiral, the difference in the cost between the battleship, without ammunition, and the carrier of the larger type, without ammunition, is about \$10,000,000, roughly?

Admiral TAYLOR. Roughly.

Mr. HICKS. In your testimony before the Appropriations Committee, as I recall, you and Admirals Griffin and McVay were of the opinion that to cancel the least advanced battleship contracts would cost somewhere between \$8,000,000 and \$10,000,000, just for the cancellation; is that correct?

Admiral TAYLOR. To cancel the one which was least advanced. We only discussed the cancellation of one.

Mr. HICKS. Between about \$8,000,000 and \$10,000,000, was it not?

Admiral TAYLOR. Yes, sir.

Mr. HICKS. Supposing it cost \$10,000,000 at the outside, to cancel it, that is the difference in cost between the carrier and the battle-

ship, completed, the way you have just given it, so if we should cancel the one that is the least advanced, and go into the building of a carrier, the carrier to cost \$28,000,000 at completion, even though we lost \$10,000,000 on the battleship contract we would not be out anything in cash as far as the net result is concerned, would we?

Mr. PADGETT. We would be out a battleship.

Mr. HICKS. We would have one battleship replaced by one carrier, but we would be out no cash, even though it might be bad business judgment on account of the waste.

Admiral TAYLOR. Your arithmetic is correct, I think, Mr. Hicks.

Mr. HICKS. Therefore it is a matter of policy wholly whether we want the battleship or the carrier in its place, because the cost at completion will not show any difference. Admiral, you and I talked the other day about the possibility of converting one of these battleships into a carrier, without a complete cancellation. Is it possible to redesign or reconstruct and utilize the material contracted for for a battleship in a carrier?

Admiral TAYLOR. Not for the kind of carrier we need.

Mr. HICKS. Therefore it would mean, if we made this swap, that we would absolutely have to salvage the battleship now under construction?

Admiral TAYLOR. You would have to throw away the ship.

Mr. HICKS. What is the net value of that salvaged material, or is it included in your net loss?

Admiral TAYLOR. Well, the loss we spoke of was a net loss.

Mr. HICKS. Thank you, Admiral, that is all I have to ask.

Admiral TAYLOR. You would throw away something in the neighborhood of \$20,000,000 if you canceled the two, if you throw away the two battleships and build airplane carriers in their place.

Mr. PADGETT. How far along advanced are you on those two battleships?

Mr. HICKS. The *Massachusetts* and the *Iowa* are the two least advanced, are they not?

Admiral TAYLOR. The battleships least advanced are the *Massachusetts*, whose hull was about one and a quarter per cent finished on the 1st of February—I have the February statement—and the *Iowa*, which is a little over 13 per cent completed.

The CHAIRMAN. Where are they being constructed?

Admiral TAYLOR. The *Massachusetts* is being constructed at Fall River, and the *Iowa* at Newport News. The machinery is somewhat more advanced.

Mr. PADGETT. How much material has been assembled and put in?

Admiral TAYLOR. The armor for those vessels is very far advanced. A good deal of it is completed, several thousand tons, I believe, on the *Iowa*—I can not give you the exact figure—and on the machinery we have made a good deal of progress.

Mr. HICKS. So, practically, Admiral, the ship is contracted for almost to its completion? If you have got the armor and machinery complete, there is not very much left, is there?

Admiral TAYLOR. It is contracted for, or under way. Of course, the armor has not been fitted yet.

Mr. HICKS. But it is contracted for, so that we would be liable for it?

Admiral TAYLOR. It is contracted for in a large measure. A good deal of it has been made.

Mr. HICKS. To get right down to the concrete proposition, you do not think it is advisable, feasible, practicable, or economical probably, to cancel one or both of these battleships that are least advanced, and build two carriers in their place, do you?

Admiral TAYLOR. I do not, Mr. Hicks.

Mr. BRITTEN. Those battleships are not entirely appropriated for, although they are started. Would it not be much wiser for the committee to take something else that is authorized, but not yet contracted for, and on which no money has been expended?

Admiral TAYLOR. I would like to say, as regards those 19 ships, that the transport and the six fleet submarines have been appropriated for as much as any other vessel of the program. The money has been appropriated to carry on the construction of those vessels, and the money is available for their construction just as it is available for the construction of the battleships which are contracted for.

Mr. HICKS. But it has not been spent yet, Admiral, has it?

Admiral TAYLOR. It has not been spent. We have a lot of money appropriated for the other ships which has not been spent.

Mr. HICKS. You have not finished them yet?

Admiral TAYLOR. We are building three of the fleet submarines at the Portsmouth Navy Yard, and we have bids for the other six.

I might say also, Mr. Chairman, that the Secretary of the Navy, I believe, when he appeared before you a month or so ago, said that he wished to take up with the committee the question of those fleet submarines and the transport; that he wished to consult with the committee as to what should be done about them.

Mr. BRITTEN. Did he have in mind, then, the probability of discontinuing their construction?

Admiral TAYLOR. I am not sure, Mr. Britten. I think he had in mind that the bids were rather high, and that he did not wish to take the responsibility of going ahead with their construction.

Admiral COONTZ. He hoped at that time to get a transport from the Army, or some other place, and that he might be able to leave the transport out. That hope has not been fulfilled.

Mr. BRITTEN. The transport will cost \$4,000,000, the 12 destroyers, \$24,000,000, and the 6 fleet submarines, \$24,000,000, making \$52,000,000 in those two items.

The CHAIRMAN. He estimates cutting out \$24,000,000. He has not contracted for those destroyers yet.

Admiral TAYLOR. The law in 1918 required those vessels to be proceeded with as soon as practicable. That law still exists, I believe, although your committee approved the delay.

Mr. HICKS. As I understand it, these 19 vessels are 12 destroyers, to cost \$24,000,000; 1 transport, to cost \$4,000,000; and 6 fleet submarines, to cost \$24,000,000.

Admiral TAYLOR. That is close to the figures.

Mr. HICKS. Making a total of \$52,000,000.

Admiral TAYLOR. As regards the transport and the fleet submarines, that does not include armor and armament, so the total cost would be over \$52,000,000.

Mr. OLIVER. You went into this matter in detail before the appropriations committee, and the figures that you there gave are correct, are they not?

Admiral TAYLOR. I hope so, Mr. Oliver.

Mr. OLIVER. You have not had occasion to correct them since then?

Admiral TAYLOR. No, sir.

Mr. OLIVER. That was only recently, and as I understand, you estimated that to suspend further purchase of materials and further work on two of the battleships would entail a loss to the Government of about \$10,000,000 on each battleship, is that correct?

Admiral TAYLOR. The discussion was entirely as regards one battleship, the one least advanced, on which the work was about 1 per cent completed. I think that on the other battleship the loss would be probably more.

Mr. OLIVER. What were the elements that entered into that \$10,000,000 loss on that one battleship?

Admiral TAYLOR. Mainly the cancellation of contracts. The machinery is all contracted for, the ship herself is contracted for, providing for her—

Mr. OLIVER. That is hardly a definite answer, for this reason, that the cancellation of contracts does involve a number of items. First, of course, would be the amount of compensation to the contractor, and the contractors would not be entitled to the whole \$10,000,000.

Admiral TAYLOR. The ship herself, as I was going to say, is contracted for for a fixed profit of \$1,650,000, in addition to a percentage on saving, and that would be one large item, which the shipbuilder would undoubtedly hold out for. In addition to that, the shipbuilder would claim damages, owing to his work being taken out of his yard, assuming he gets no other work.

Mr. OLIVER. In other words, the damages in the way of pay to the contractors would not sum up \$10,000,000.

Admiral TAYLOR. That implies—

Mr. OLIVER. That implies that the loss on materials that were purchased which otherwise you could not use?

Admiral TAYLOR. The major part of that \$10,000,000 would be claims from contractors, because the machinery is being built by subcontract to a large extent, and progress has been made on it, and the shops are being devoted to that work, and the contractor would undoubtedly claim large damages. The same applies to the armor, not so much the armament, because the armament is being made in considerable part by the Government, but a large portion of that \$6,000,000 to \$10,000,000—we did not estimate exactly \$10,000,000—would undoubtedly be made up of claims of the contractors for loss of profit and actual damage.

Mr. HICKS. How much of an experiment do you consider an airplane carrier such as you contemplate? Are you convinced in your own mind that you can provide every facility to make that a successful carrier?

Admiral TAYLOR. I have no reason to doubt it, Mr. Hicks. If we build a carrier now, the next one will probably be improved, just as the next battleship will be improved. But this thing did not come

up yesterday; we have been talking about it for three years. We have been over this thing a number of times, and we are prepared to build a carrier that will carry a large number of seaplanes and meet the demands now made by the airplane people.

Mr. HICKS. Have you access to the British plans for their carriers?

Admiral TAYLOR. Not in detail, but we know reasonably well what they are.

Mr. HICKS. Enough so that you can use them as a basis for your own investigation?

Admiral TAYLOR. Some of the British carriers have not been very successful.

Mr. HICKS. And you think you can overcome their failures, do you?

Admiral TAYLOR. I think we will have no difficulty in making a satisfactory carrier.

Mr. HICKS. I have faith in you, Admiral.

Admiral TAYLOR. Thank you very much, Mr. Hicks.

Mr. HICKS. How long did you say it would take to build them?

Admiral TAYLOR. I think that depends on how liberal you are with money and the conditions, but it would be very difficult to build one in two years. I would not like to undertake it under 30 months.

Mr. HICKS. That is, after the authorization was granted, it would take about 30 months to put a vessel in commission?

Admiral TAYLOR. At least that time from the granting of the authorization.

(Thereupon the committee adjourned.)

ADDENDA CONCERNING THE PROPOSED UNITED AIR SERVICE.

ATTITUDE OF THE NAVY WITH REGARD TO THE ORGANIZATION OF AN AVIATION SERVICE.

STATEMENT BY CAPT. T. T. CRAVEN, DIRECTOR OF NAVAL AVIATION.

The Navy retains the view that the aeronautical arm should be molded completely into the naval organization. Otherwise, it can not have that full sympathy and support which comes only through close familiarity and community of interest. The complete effectiveness of aviation in distant overseas operations can not be developed except through close and intimate association with a naval power; consequently, the advancement of fleet aviation will be retarded if the aeronautical branch is in any degree separate and exists otherwise than as a definite and integral part of the naval service.

The retention of aviation as a concrete part of the organizations of the Navy and also of the Army may be defended under three separate heads:

1. ECONOMY.

The first is that of economy.—If an entirely separate and distinct organization for the control of aviation is created, the elaborate systems now in existence in the Navy and the Army for the procurement and transportation of materials must be duplicated in this new organization. A new personnel and another medical department, together with a legal section containing the offices of a judge advocate and solicitor, must be created for the new service. The radio and communication organizations now existing in these older departments of the Government must be duplicated.

Another public works as well as a new ordnance department must come into being. The Navy and the Army to-day lend freely to aviation to the value of many millions of dollars through the various bureaus and offices existing in their organizations. Naturally they could not continue to do so with the aviation branch under a separate governmental department.

It can be clearly shown that with the establishment of a new, separate, and distinct department of the Government, all of these activities, as enumerated above, must be recreated, with a considerable increase of expense to the Government for salaries to cover the cost of the many new positions which must of a necessity come into existence. Incidentally it may be noted that as a part of the proposed organization of a great new department of the Government, additional housing facilities and public works to accommodate the new branch in Washington and elsewhere must be provided separate and distinct from those now existing.

2. PRODUCTION OF MACHINES.

The second heading under which may be discussed the proposition of combining all of aviation in a single and new department is that of the production of machines. The proposition to produce under a single head and under one organization is alluring, but will not stand close scrutiny with the aviation art in its present experimental condition. The Navy has not yet developed the type of machine suited to its needs, and until the present it has struggled with the seaplane or with adaptations of the Army types. Land machines, land tactics, and knowledge of overland aviation in general are well advanced. The contrary is true, in so far as the perfection of naval apparatus and of naval aviation methods are concerned.

The time to standardize in naval aviation has not yet arrived. In developing the naval plane, the operator must work closely in conjunction and in sympathy with the designer and the manufacturer. Both must have intimate and personal knowledge of naval needs, and such can not be the case with a combined and separate production system, and such a plan would not insure to the Navy the types which it desires or the quantities in which these should be supplied to our fleets.

In passing, attention may be invited to the fact that the Navy is accustomed to delivering attack from ships and also to resisting the attack of ships. It hopes to utilize aviation for both these purposes. The Navy is constantly experimenting and working with weapons and devices for increasing the power of its attack and also for increasing the strength of its resistance. With these details the Army has never been particularly and intimately concerned, and can not be as well informed as is the Navy. As a concrete example of the development of a naval device, let us take the torpedo which for many years has been purely a naval weapon and to the production of which the Navy has devoted large sums of money and considerable effort. It would seem that the airplane supplied a natural vehicle for the conveyance of the torpedo. At the present stage of the development of that delicate and complicated mechanism, and with conditions as at present, to separate the advancement of the torpedo for aviation from the development of the plane which is to convey it would appear to be, to say the least, irrational.

3. EFFICIENCY OF OPERATION.

The third heading under which the objections to a combined service may be discussed is that of efficiency of operations. Except in the elementary work of learning to fly, there can be no doubt that the training and operations of the personnel engaged in naval aviation are entirely different from the training and operations of those who work overland in conjunction with armies. The useful application of flying is the important detail for the aviator in war, and of the difficulties with which the naval aviator contends the soldier can have no knowledge. Of the difference in the character of the problems presented to the military and naval services, he is entirely uninformed. The details of communications and of position finding are of paramount importance. The aviation arm must be employed in combination with our other arms and not independently. In battle, unity of command is a first requirement. Mutual familiarity with the capabilities of the different arms engaged is, of course, essential. How this can be obtained upon the day of action unless brought together in preparation for battle when training is being given is not evident.

Attention is invited to the statements which follow, made by distinguished leaders, bearing upon this subject. The Navy and those concerned with naval aviation in the United States are in accord with the statements of these high authorities and with the arguments advanced by those whose remarks are quoted.

Numerous methods have been suggested, any one of which might be followed in the building up of this new branch and for the promotion of civil aviation which, of course, must supply the backbone of the aviation arm.

At present it must seem evident that the most economical and the simplest is that which we should utilize.

The problem of developing aviation, of placing the new industry upon its feet, and of overcoming the inertia of service conservatism, must be attacked directly. Legislation should give to each department of the Government employing aviation an organization for dealing with aviation matters which will permit their complete cooperation.

Having secured similar organizations in the various departments, immediate steps to prevent duplication and to insure coordination in progressive development between the various services are requisite. To this end must be legalized a board or committee composed of representatives of all departments of the Government utilizing aviation and of civil interests, which has definite and legal responsibility for the coordination of the aviation work of the different departments and of avoiding duplication. Every department of the Government which can find a use for aviation should be encouraged to employ it, for at this time and for some years to come the development of the infant industry and of the new art must depend primarily upon governmental support.

In view of past history, it is unreasonable to expect our country to maintain a national military aviation organization adequate to prevent invasion or to supply a sufficient reserve of military and naval flying personnel for the purposes of the furtherance of national policies, extending to distant corners of the globe. Both the Army and the Navy, therefore, are vitally concerned in the promotion of civil aeronautics. Through its advancement, technical and inventive talent, industrial facilities for the production and operation of planes, together with the development of skilled man power in great strength, all valuable military assets, are provided. Successful civil inventive genius must be recognized through competition in the design and operation of aircraft promoted by the Government and suitably rewarded. The enactment of laws for the licensing of pilots and the inspection of machines, thereby making for safety and for the promotion of interest in flying, is the plain duty of our legislative bodies.

STATEMENT OF GEN. PERSHING.

Gen. Pershing expressed himself on January 12 of last years as follows with regard to the desirability of a United Air Service:

"I am at a loss to understand how my opinion on the question of a separate Air Service as expressed at the joint meeting of the Senate and House Committees on Military Affairs could be misinterpreted. In those hearings and on many other occasions, I expressed my view that the Air Service for military purposes should remain a part of the Army. I urged, of course, the very great necessity for developing aviation in a commercial way and for other than military purposes as an invaluable adjunct to military preparation in time of peace.

"Before the joint meeting of the Military Affairs Committees I indicated my belief that some cooperation and coordination between the different departments of the Government using airships might well be obtained, and, in fact, that such coordination was essential to the development of aviation. The question of coordinating the industrial end of aviation is, of course, an entirely different matter from the proposition of taking away from the Army this Air Service and establishing a Department of Aeronautics independent of the control of the War Department.

"I am glad to answer the questions you asked in your letter specifically, and I am giving my answers below the same headings that you gave your questions.

"Military forces can never be efficiently trained nor operated without an air force.

"An air force, acting independently, can of its own account neither win a war at the present time, nor, so far as we can tell, at any time in the future.

"An air force by itself can not obtain a decision against forces on the ground.

"A military air force is an essential combat branch and should form an integral part of the Army.

"If success is to be expected, the military air force must be controlled in the same way, understand the same discipline, and act in accordance with the Army command under precisely the same condition as other combat arms.

"An air force, as well as all other branches of the military organization, must fully understand its exact functions in working with other branches, must know the needs of other branches, be in full sympathy with them, think in the same military atmosphere, and have the same esprit de corps in order that effective battle control may be established.

"No such force can realize the above conditions unless it be an integral part of the command not only during the battle but also during the entire period of doctrinal training.

"To realize these conditions the different arms of the service must live together and train together.

"An air force should be established as a separate arm of the service, coordinate with the Infantry, Cavalry, and Artillery.

"An air force should not be established as a combatant force distinct from the Army and Navy."

On page 256 of the *Crisis of the Naval War*, by Admiral Jellicoe, we read the following:

"In the matter of organization we must be certain that adequate means are taken to ensure that the different arms which must cooperate in war are trained to work together under peace conditions. A modern fleet consists of different types—battle-ships, battle cruisers, light cruisers, destroyers, and submarines. Before I relinquished the command of the Grand Fleet, large seagoing submarines of high speed, vessels of the K class, had been built to accompany the surface vessels to sea. It is very essential that senior officers should have every opportunity of studying tactical schemes in which various classes of ships and kinds of weapons are employed. In considering the future of the navy it is impossible to ignore aircraft. There are many important problems which the navy and the air service ought to work out together. A fleet without aircraft will be a fleet without eyes, and aircraft will, moreover, be necessary, not only for reconnaissance work, but for gun-spotting, as well as, possibly, for submarine hunting. Air power is regarded by many officers of wide practical experience as an essential complement to sea power, whatever future the airship and airplane may have for independent action. A captain who is going to fight his ship successfully must have practiced in time of peace with all the weapons he will employ in action, and he must have absolute control over all the elements constituting the fighting power of his ship. In a larger sense, the same may be said of an admiral in command of a fleet; divided control may mean disaster. The advent of aircraft has introduced now and, at present, only partially explored problems into naval warfare, and officers commanding naval forces will require frequent opportunities of studying them. They must be worked out with naval vessels and aircraft acting in close association. With the air service under separate control, financially as well as in an executive and administrative sense, is it certain that the Admiralty will be able to obtain machines and the personnel in the necessary numbers to carry out all the experimental and training work that is essential for efficiency in action? Is it also beyond doubt that unity of command at sea, which is essential to victory, will be preserved? In view of all the possibilities which the future holds now that the airship and airplane have arrived, it is well that there should be no doubt on such matters, for inefficiency might in conceivable circumstances spell defeat."

GEN. LEONARD WOOD, UNITED STATES ARMY.

[Hearing before Committee on Military Affairs, Sept. 10, 1919.]

I do not believe that it is necessary to have a special Cabinet officer at the head of this service. I feel that both Army and Navy should have their own aviation arms, and that each should be familiar with the other's work as far as possible, so that in case of war we could throw the bulk of our aviation with the Army or with the Navy, as the case may be.

I do not believe that we should detail permanently in the Air Service the highly technically trained Regular officers of the Army. They are needed in the command of troops or in the special work for which they have been trained. We can develop aviation force advantageously from civilian life, and we should avoid the detachment of line and staff officers from the Regular Establishment for permanent service in the air force. Life in the Air Service, at least the flying part of it, will be short, and from that men will pass to aviation nonflying sections.

Army aviation units should be stationed with troops in time of peace. They are necessary for the proper training of the troops and for the proper conduct of maneuvers, and service with the troops is necessary for the training of the air units.

We must not again be caught as we were during this war. It is too late to develop the Air Service after war begins. We spent enormous sums of money for Air Service and got practically nothing out of it in the way of fighting machines, and little in the way of anything else until it was too late. The shortage of Air Service was undoubtedly heavily paid for in the loss of life among our troops. Without air control we can not have effective artillery work, and effective artillery work is absolutely essential in modern war.

Let us not again leave things to luck, but get ready for war in time of peace.

LETTER FROM PRESIDENT OF NAVAL WAR COLLEGE TO CHIEF OF NAVAL OPERATIONS.

FEBRUARY 1, 1921.

Form: President, Naval War College.

To: Chief of Naval Operations.

Subject: United air service.

Reference: (a) CNO letter No. 3084-D-23 of January 20, 1921.

1. The president of the Naval War College has given very careful consideration to the developments that have occurred in aeronautics before, during, and since the outbreak of the World War, and is of the opinion that air power must logically be regarded as a very essential component of sea power and that, in consequence, any consideration of the future development of the Navy must necessarily include a consideration of air power.

2. The maximum of success in naval warfare can be achieved only by the coordinated employment of all types of naval craft, and such coordination is possible only when all of these several types of craft are operated by personnel trained and indoctrinated along similar lines and in one common school, which is the fleet.

3. In as far as the future employment of air power in connection with sea power can reasonably be foreseen, it appears certain that battle fleets in future will be accompanied by airplane-carrying ships, similar to those already in service abroad, and that the capital ships themselves will, in addition, carry a limited number of aeroplanes. Generally speaking, these planes will be used either offensively against enemy capital ships (torpedo planes with fighting planes for protection) or for reconnaissance work (scouting planes), and for controlling gunfire.

4. Air forces operating over the land must cooperate strategically and tactically with land forces—the Army, and, similarly, air forces operating over the sea must cooperate strategically and tactically with naval forces—the fleet; and the latter must, therefore, be trained by and operated under the command of the naval commander responsible for the execution of the combined naval operation.

5. Army aviators must be a part of the Army; they must have Army training; and they must be thoroughly indoctrinated in the methods and operations of all branches of the Army. Likewise, naval aviators must be a part of the Navy; they must have naval training; they must be thoroughly indoctrinated in the methods and operations of all types of naval craft, and they must speak and comprehend the language of the sea.

6. Army aviation, due to its rapid development during the World War, has reached a stage where operations are more or less standardized, and most of the types of aircraft required have been determined upon with a very considerable extent of accuracy. Naval aviation, on the other hand, was greatly restricted in its operations during the World War, and, in consequence, is still in the experimental stage. Its progressive development is imperative and, to be efficient, it must take place under the responsible control of the Navy.

7. The fleet air force of the future will consist of one or more divisions of airplane-carrying ships; and it will be just as much an integral part of the fleet as the submarine force or the destroyer force. This force must, therefore, be operated by personnel thoroughly indoctrinated with the views of the commander in chief, in order to achieve unity of command so essential to success.

8. The flying skill of the most expert airmen would be of little use to the Navy unless they were seamen and sea flyers in the sense that they had been trained with the fleet, and indoctrinated by the fleet, to understand and carry out the intentions of the commander in chief.

9. Moreover, this nautical training with the fleet and by the fleet is wholly essential to the development of the naval planes and all the appliances by which they can be most efficiently handled by the airplane carriers.

10. This necessity for naval aviators trained by the fleet is shown in all the tactical games in which planes are used; that is, those officers who handle the planes do so in accordance with the nautical and tactical knowledge derived from their naval training and experience.

11. In view of the foregoing, and after mature deliberation on this subject, the president of the Naval War College is absolutely opposed to any measure whatsoever looking to the amalgamation of the United States Army and Naval Air Services.

WM. S. SIMS.

Recent reports from Great Britain are to the effect that the naval service is far from satisfied with the present organization of aviation in that country. It has sought to overcome the fundamental difficulties by detailing certain of the personnel of the air force for work permanently with the Navy, and effort is being made to increase interest of the Navy in the aeronautical arm. It is believed that the statement is

correct that in so far as the Navy is concerned the united air service has been a failure.

The following quotation from an editorial appearing in the *Aeroplane*, a British publication, gives in terse and precise language the experiences of Great Britain during the war and the ruinous consequences of combining naval aviation with a united air force:

"The first and most obvious objection to a single (united) air force is that the air is not actually a separate war area, but is used equally by armies and navies alike, and any operations in a big war which involve the use of aircraft must come under the command of either the Army or the Navy. There are practically no conceivable aerial operations which can be carried on in a war independently of the strategy of either the Army or the Navy, and the majority of the air work in a war is interlinked with the tactical operations of either the land or sea service. Thus it is inconceivable that an air force could carry on the war without the other arms, although it is quite conceivable that the Navy could carry on a war without either the Army or the air force and that the Army could carry on the war without the Navy or the air force (provided that the other side has no aircraft). When once this is accepted as a basic fact, the absurdity of a separate air force must become evident.

"On purely selfish grounds, namely, the welfare of the aviators themselves, it is entirely desirable that there should be two separate flying services, one for the Army and one for the Navy. In the late European war Great Britain was the only country which was foolish enough to form a separate air force, and the immediate result of the formation of that air force was a marked decline in the efficiency of the personnel and in the quality of its equipment.

"So long as the royal naval air service and the royal flying corps existed as two separate services each had its own esprit de corps and each vied with the other in its efforts to be smart and efficient. As soon as the two were amalgamated the personnel lost all pride in their work, the soldiers wished they were back with the army, the sailors wished they were back with the navy; sailors were put on to do soldiers' work, soldiers were put on to do sailors' work; the work was done thoroughly badly; the organization which became a mixture of naval and military procedure became so involved that nobody ever followed the proper routine if they could avoid it, and the whole morale of the air force fell to pieces, with the result that at the end of the war—although the royal air force was many times as large numerically as the royal air service and the royal flying corps put together—it did less work and did not do it anything like as well.

"The question of the supply of materials was even more adversely affected by the combination and possibly this aspect of the question may be more readily understood by business men than the purely service aspect. While two separate services existed, each was in direct competition with the other as to which should secure the best airplanes, the best engines, the best armament and the best equipment generally. If an inventor had a good idea which was turned down by the royal naval air service, he took it to the royal flying corps, who, simply because it had been turned down by the R. N. A. S., took the trouble to investigate it thoroughly, always hoping that they might have struck something which the R. N. A. S. had missed, so that they would be able to score over the R. N. A. S. by using it. In exactly the same way the R. N. A. S. would give the most careful consideration to anything which had been turned down by the R. F. C. As soon as the two services were amalgamated there then became one single line of supply, and if a man's invention or if a new type of airplane or engine was turned down by one single technical department or by one supply department of the technical department there was then no other parallel line along which the inventor or designer could get to work so as to get fair play for his ideas. The result was that if there happened to be a fool or a knave in one particular supply department—as unfortunately, there very frequently was—the whole of the R. A. F. was deprived of a very valuable airplane or engine or fitting, as the case might be. Good things were turned down either because an official was not intelligent enough to recognize their goodness or because he was not bribed to give the matter his attention or because he happened to have a personal dislike for the individual who introduced the particular article or merely because he happened to be feeling ill or feeling lazy that particular day and would not take the trouble to investigate the thing which was introduced to him.

"The result of this state of affairs was that at the end of the war the royal air force had not in use one solitary type of airplane or engine which was less than a year old in design, and, with one exception, all the types in use at the signing of the armistice had been actually in the field by the middle of the year 1917. Furthermore, so badly was the technical and supply side of the R. A. F. run that it was well known among

the supply people of the army in the field that if the war had gone on for another six months the royal air force would practically have been without any reliable engines above 130 horsepower, with the exception of a small supply of Rolls Royces. Yet despite this state of affairs there were actually in England airplanes and engines of designs which had been flying for 18 months with complete success and had given proved results very much superior to any engines or airplanes actually in use.

"If those who are interested in this subject will take the trouble to investigate the matter at close quarters, they will find that the single air force idea is utterly wrong from the point of view of the fighting service, and, therefore, of the Nation as a whole. The position will perhaps be more readily understood if one points out to business men that a single air force entails necessarily a single line of supply, and that it is about as sensible to supply the two fighting forces of the Nation with their aerial material and personnel through a single line of supply as it would be to try and feed an army in the field through a single line of railway. One slight defect in that line means starvation for everybody at the end of the line."

The following quotation from a letter from Rear Admiral J. Strauss, the commander of the mine force, United States Atlantic Fleet, to the Secretary of the Navy, dated August 17, 1919, is of interest:

"The writer had conversation recently with an officer of the Royal Air Forces of Great Britain, who stated that the amalgamation of the naval and military air forces had not worked to advantage. This officer had been attached to the staff of one of the admirals afloat during the war and was fully cognizant of the difficulties attendant upon the system. He found that the lack of sea experience on the part of the aviators was a serious handicap, but the principal difficulty lay in the fact that instead of getting the prompt action that would have been obtained by a direct order from the admiral in command of the air service, assistance was delayed through having to obtain the consent and cooperation of another head which might or might not be ready to promptly afford such assistance. This resulted in clogging the mechanism, so to speak. While it might be thought that having the Army and Navy air forces under one head would result in reducing the expenditures, as would be the case in combining the manufacturing or commercial interests, for instance, it would as a matter of fact have exactly the opposite effect. Instead of maintaining two military services as at present, three would have to be maintained, with a consequent increase in 'overhead' expenses."

The following is a copy of a letter received from the commander United States naval forces operating in European waters, Admiral H. S. Knapp:

"The amalgamation of the Royal Flying Corps and the Royal Naval Air Service into a single Royal Air Force largely arose from the peculiar conditions brought about by the war. There was an overwhelming need of aircraft for work with the army whereas the enforced stay in port of the German fleet largely curtailed the activities of the Royal Naval Air Service. Under these circumstances many of the naval aviators were detailed to duty with the army and the advocates of a single air force had a strong argument due to the circumstances of the moment in that fact. There was a separate air minister, Lord Rothermere, until the reconstitution of the Government, when on January 11, 1919, the Hon. Winston Churchill was made minister of state for war and air and Gen. Seely was given the post of undersecretary of state for air.

"I regard this as a backward step, even admitting the desirability of a single air service, and Gen. Seely made an impressive point in his speech in the House of Commons on November 12 when he spoke of the impossible situation created by the Admiralty going to the war minister for the allotment of aircraft to naval activities.

"I have talked with a good many officers of the British air service. I find some enthusiasts for a single service, many who are noncommittal admit that there are strong arguments on both sides; and some, usually officers of the British Navy, who are opposed to the present system in England. As the air ministry is now constituted officers who come from the British Army naturally feel that their interests are quite safe; on the other hand, naval officers feel that their interests are seriously jeopardized, and their fear is a perfectly natural one.

"I have had the argument advanced to me that the training of airmen made remarkable advances over what had been done in the separate services, after the amalgamation took place. I have only very recently heard this and have not had an opportunity to verify it by any extended inquiries. I very much doubt if the argument is sound as applied to conditions generally existing, although it may possibly have been sound as applied to the particular training of airmen for the very particular service required during the war.

"My own feeling concerning the training of airmen for naval activities is that they must be themselves men of the sea and I find this feeling is strongly held by, I should say the large majority of British naval officers with whom I have discussed the matter.

There are undoubtedly some strong reasons for a combined Air Service. The science of flying is in a process of evolution and much work in experimentation, in mass production and in other ways, could undoubtedly be more economically done with a single air service than with a number of separate ones. But the time comes when there must be a separate design for the different kinds of service.

"While military aircraft are now being used for commercial purposes, I am strongly of the opinion that as they wear out and time goes on it will be found that civil aircraft will become strongly differentiated from military aircraft and both will be strongly differentiated from naval aircraft. This differentiation will begin with the design and as far as material is concerned will end with the finished product. I believe it will also exist in training; in fact it does exist in training. The trained civilian flyer is not a competent military aviator and still less is he a competent naval aviator. As I believe the differentiation in material will increase, I also believe the differentiation in training will increase. I see no more reason why there should be a single air service for military, naval and civil aircraft, than why there should be a single shipping service for naval vessels, army transports and merchant ships, nor why it is necessary or adequate, as far as training is concerned, to have one separate organization any more than it would be necessary and adequate to have a single course of training for a body of men who were to be soldiers, sailors or merchant seamen.

"As a final observation, I believe that the very peculiar circumstances under which naval warfare has existed during the five years of European war, have disguised the real position of naval flying. The German fleet was so shut up and impotent that many of the activities of naval flyers that have been foreseen as useful in time of war have no opportunity to be exerted. It is my own strong opinion that the United States Navy should have its own personnel and matériel to care for its own aerial activities."

The following is quoted from the Army and Navy Gazette, London, England, dated June 28, 1919:

"The appointment of Capt. Wilmot S. Nicholson, R. N., as captain (A) of the Atlantic Fleet, in succession to Rear Admiral Sir Richard Phillimore, who was known as admiral commanding the flying squadron, Atlantic Fleet, is indicative of the present conception in the navy of the use and duties of aircraft. So far as organization goes these machines will occupy the same relative position in the fleet as destroyers or submarines, which are under captains (D) and (S) respectively. The implication is that instead of being kept together in a squadron all to themselves, the aircraft carriers, like the destroyers, will be detailed as occasion requires, to accompany the fighting ships for scouting purposes and the like. The experiences of the war all tended to show that the value of aircraft lay as much in their use as adjuncts to the larger vessels as in their separate employment. At the time of the battle of Jutland it appears that there were only three aircraft carriers serving with the forces in home waters, the *Campania*, *Vindex*, and *Engadine*, attached respectively to the Grand Fleet, the Harwich force, and the battle-cruiser force. A great deal of experience has been gained since then, and it would seem that one lesson taught by it is that as many of the fighting ships of the navy as possible should be equipped to carry aircraft. An airplane and flying off platform are an essential part of the equipment of our future battleships and cruisers. Light cruisers, such as the *Capetown*, which is being launched at Birkenhead to-day (Saturday) are already being so equipped. Before long a qualified pilot, navigator, and observer must form part of the cadre of almost every ship, and it becomes increasingly difficult to see how the men and material necessary for this can be better supplied from outside service. The whole question of the constitution of the naval air force demands reconsideration."

The following remarks comprise the conclusion of the Sixth Annual Report of the National Advisory Committee for Aeronautics, which are of particular interest and value at this time as bearing upon this discussion. It will be recalled that the National Advisory Committee is an unprejudiced body which has devoted itself to the careful study of aeronautical subjects.

A NATIONAL AVIATION POLICY.

"Aviation activities during the war were concentrated on the development and production of military aircraft. The selection of the landing fields that were established was necessarily guided by military considerations. The close of the war found us with an aeronautic industry at the stage of quantity production, a large amount of aircraft material on hand, a large number of trained flyers, and a few scattered landing fields. In brief, all this constituted the national inheritance from the investment of hundreds of millions of dollars for the hurried development of military aviation during the war. In the two years that have elapsed since the armistice a good proportion of the aircraft material has become obsolete. A majority of the technical

personnel and trained flyers have returned to civil life and to pursuits not connected with aviation. The great aircraft industry has almost disappeared, and some of the landing fields have been surrendered. Those that have been retained really represent one of the most valuable physical assets salvaged from our aircraft expenditures.

"As a nation we must seek to realize clearly the lessons of the war and to profit by them. Our efforts in the development of a military air force and the organization of an aircraft industry during the war were remarkable accomplishments in themselves, but the handicap of a negligible industry at the outbreak of the war and the general lack of technical knowledge were too great to be satisfactorily overcome in a short time, regardless of the money available. It is now our clear duty to take to heart the lessons and mistakes of the war period and to shape a national aviation policy that will be productive of the greatest possible structural development consistent with prudent economy.

"The Government agencies actively concerned with the use of aviation at the present time are the Army Air Service, the Naval Air Service, and the Postal Air Service. Other agencies, such as the Geological Survey, the Coast and Geodetic Survey, the Forest Service, etc., have more or less need for the use of aircraft in their work. The National Advisory Committee for Aeronautics is concerned not so much with the promotion of the uses of aviation as with the scientific study of the problems involved and the technical development of the art for the benefit of governmental agencies and of the public generally, but the committee believes that the use of aircraft by the various governmental agencies should be encouraged where its efficient use is practicable; also that the general development of aviation for all purposes should be encouraged by the National Government. The faithful performance of our national duties in these respects becomes compelling from considerations of wise military preparedness.

"In time of war aviation will probably be the first arm of offense and defense to come into action. For this there must be an established industry and a trained and active air service. Aerial supremacy at the outset of hostilities would be a tremendous military advantage. Ultimate victory would unquestionably incline to the side that could establish and maintain supremacy in the air. Huge expenditures of money in time of danger and frantic efforts to train personnel and to develop hastily an aircraft industry from almost nothing will not do. There must be wise preparedness; there must be in healthy existence at least a nucleus of an industry capable of adequate expansion; there must exist civil and commercial aeronautical activities in all parts of the country which would be the main support of the industry in time of peace. In pure self-defense the Government must encourage the development of commercial aviation. The alternative proposition is the creation and maintenance of a powerful standing military air service relatively self-reliant in time of war. We can not, however, afford the expense which such a policy would entail, and there would be no advantage in time of peace from such expenditures comparable in any way to the advantages to be gained from the support of civil aviation. We should maintain an active air service in time of peace, which should possess inherent strength and be something more than a mere nucleus for expansion in time of war. In the final analysis, however, we must depend upon civil aviation to furnish a military reserve force. The remarkable accomplishments of our Motor Transport Service during the war were only made possible by the healthy condition of our automobile industry. The problem is to place our aircraft industry in a healthy condition, and to do this we must enter without delay upon a sane, sound policy for the development of civil aviation. The relative cost of fostering an organized plan to develop commercial aviation would be much less than the waste that would inevitably result from unprepared entry into war. Aside from military considerations, the fostering of commercial aviation would in time yield adequate returns in itself in the form of promoting and strengthening our means of transportation, advancing the progress of civilization, and increasing the national wealth.

"Aviation is a distinct advance in civilization given to the world by America. The importance of the development of aviation from a military standpoint was not fully appreciated before the war, with the consequent lack of encouragement of the development of the art. The handicap of years of comparative inactivity has not yet been overcome. We can not afford to repeat the mistakes of the past. We can not go backward, but must go forward with the intelligent development of aviation in all its branches.

"Aviation is still in its infancy; its possibilities, while unknown, appeal to the imagination. The forced development during the war and some of the experimental development since have not been based upon scientific research and sound scientific principles that make for substantial progress. Technical training is necessary, includ-

ing education in advanced aeronautical engineering, so is the actual training of a large body of men in the technique of the care and operation of aircraft. Broadly speaking, scientific research, technical training, and commercial aviation constitute, or should constitute, the backbone of a national policy.

"Reducing to definite form the steps which in the opinion of the National Advisory Committee for Aeronautics are wise and timely, the committee, after careful consideration of all the facts within its knowledge, submits the following specific recommendations:

First. That legislation be enacted providing for Federal regulation of commercial air navigation, licensing of pilots, aircraft, landing fields, etc. At the present time there is no authority of law for any executive agency of the Government to perform such duties.

The committee believes that for the executive administration of these new duties of government there should be established in the Department of Commerce a bureau of aeronautics in charge of a commissioner of air navigation, who should also become a member of the National Advisory Committee for Aeronautics. Acting in cooperation with the War, Navy, and Post Office Departments, the committee has prepared a draft of legislation which appears in full in a preceding section of this report under the heading "Organization of governmental activities in aeronautics," and which it strongly recommends for the immediate consideration of Congress. In this connection the committee recommends also the adoption of a policy of Federal aid to the States in the establishment of landing fields for general use in every State in the Union.

"Second. That the Congress authorize an American airplane competition in order to stimulate private endeavor in the development of new and improved designs of aircraft, the competition to be under the direction of the National Advisory Committee for Aeronautics, the entries of the successful competitors to be purchased by the Government at a predetermined and announced figure and made available for the use of the Postal Air Service.

"Third. That adequate appropriations be made for the military and naval air services in order to permit the continuous development of these exceedingly important arms of the two services, and to enable them to place orders in such a way as to maintain a nucleus of an aircraft industry capable of sufficient expansion to meet military needs in time of emergency. The committee considers this absolutely essential.

"Fourth. That the control of naval activities in aeronautics be centralized under a naval bureau of aeronautics in charge of a director of naval aviation. At the present time responsibility for the development of naval aviation is divided between the Office of Operations and the numerous bureaus of the Navy Department. This basis of organization does not permit full cooperation with the Army Air Service or with other governmental and civil agencies, nor does it, in the opinion of the committee, promote the efficient development of aviation within the Navy.

"Fifth. That the Air Mail Service of the Post Office Department be further extended and developed. This service has given the best demonstration of the practicability of the use of aircraft for civil purposes. It has been seriously handicapped by inability to secure suitable airplanes adapted to its work. The question is one of design, which should be handled by the industry. The remedy lies in the development of the industry, which can only be brought about at an early date by the indorsement and prosecution by the Government of a constructive comprehensive policy.

"Sixth. That the Congress approve the program of scientific research in aeronautics formulated by the committee and provide for the enlarged facilities necessary for its prosecution. Continuous scientific research is necessary for the real advancement of the science of aeronautics. The number and importance of problems requiring solution have increased greatly with the general development of aircraft, and the development of airplanes of all-metal construction will require a large increase in the aerodynamic research and engineering experimentation conducted by the committee at the Langley Memorial Aeronautical Laboratory at Langley Field, Va."

ADDITIONAL STATEMENT OF REAR ADMIRAL BRADLEY A. FISCHE.

WASHINGTON, D. C., February 8, 1921.

Representative HICKS,
The Capitol, Washington, D. C.

MY DEAR MR. HICKS: It would be absurd in the highest degree to attempt to direct the aeronautic activities of the Navy under any Air Service of any kind that has thus far been suggested for the reason that no person or persons not acquainted thoroughly and trained thoroughly in seamanship and practical navigation could possibly direct them, except in the wrong way.

Gen. Mitchell has achieved high success in mastering the comparative simple problems of scouting, pursuit, and bombing over the land; and if the naval problem was restricted to scouting, pursuit, and bombing over the sea, one might, for the sake of argument, admit that Army officers or aviation officers could direct the aeronautic activities of the Navy. But this is not the case. The naval problem centers around the torpedoplane, and the torpedoplane centers around the automobile torpedo; and no one knows anything about the automobile torpedo except those Navy officers who have been thoroughly trained in seamanship and the care and management of the torpedo itself. The automobile torpedo is the most highly specialized weapon in the world; and I think I am not wrong in saying that it is the most highly specialized piece of mechanism in the world. The major part of the Navy's problem, aeronautically speaking, is to direct the torpedo from a torpedoplane against the side of an enemy ship.

Next to the development of the construction and operation of the torpedoplane, is that of the airplane carrier. While this problem may be considered secondary to that of the torpedoplane (at least in point of time), it is ahead of it in point of difficulty; for the reason that we know a great deal about the torpedoplane, including the torpedo, but very little about the airplane carrier. In addition to the torpedoplane and the airplane carrier, the Navy must work out the purely Naval problem of operating them in conjunction with submarines and all surface craft, and in cooperation with the commander in chief of the fleet and the commanders of the various subdivisions.

The difficulties of developing aeronautics for naval purposes are immeasurably greater than those of developing aeronautics for military purposes; just as the difficulties of naval gunnery are greater than those of military gunnery; and as, in general, naval problems are more difficult than military problems, because the sea is a more difficult element to operate on than the land.

If Gen. Mitchell realized 10 per cent of the difficulties of naval aeronautics, I am confident that he would never advocate putting naval aeronautics under any other head than a purely naval one, or imagine that a united air service could have any other effect on the Navy than to injure it, and retard the development of naval aeronautics.

Sincerely, yours,

BRADLEY A. FISKE,
Rear Admiral, United States Navy.

[From Aviation.]

ECONOMY AND AERIAL DEFENSE—AERONAUTICS HAS INTRODUCED A NEW ELEMENT INTO WARFARE AND HAS CARRIED WARFARE INTO A NEW ELEMENT.

"We've reached the epoch—prodigious in its advent—when positively the air commands and dominates both land and sea. * * * The air commands the water; unless all warships can get under the water they will be blown out of the water;" (Lord Fisher.)

"The arm that will serve the enemy will be that arm that is the newest, the most sudden and most terrible—the airplane." (Marshal Foch.)

"The battleship is dead. The future is with the airplane." (Admiral Sir Percy Scott.)

THE BIG-SHIP CONTROVERSY.

[From Flight (London) Jan. 6, 1921.]

We have naturally followed the controversy relating to the future of our naval shipbuilding policy with more than a little interest, but the more we read the more are we reminded of the proverb which asks: "Who shall decide when doctors disagree?" It is practically impossible for the lay mind to arrive at anything like a settled opinion after reading the columns of print which are contributed to the daily press by distinguished retired admirals and senior officers of the Navy, each one of whom appears to have his own ideas and conceptions of how the future sea wars will be fought and won.

The worst of it all is, from the point of view of the outsider who strives for enlightenment, that every letter he reads seems to smack of special pleading, an impression which is very often strengthened when the record of the writer is looked up and it is found that he is a distinguished specialist in the particular branch of the service

upon which he apparently pins his faith. Naturally, it is expecting a great deal when we ask the submarine specialist to admit that the future of naval war lies in the hands of the big ships. Nor is it logical to expect an officer whose principal service has been in battleships to agree with the school which avers that the big ship can not put to sea in the face of the submarine menace, and can not even remain safely in harbor because of her vulnerability to attack by torpedo-carrying aircraft.

Hence the only way to arrive at conclusions is by careful reading and weighing of all that is said on every aspect of the question, and a careful elimination of all that seems biased by the known service and inclinations of the witness. The tendency we have in mind is well demonstrated by the fact, to which Admiral S. S. Hall draws attention in a letter to the Times, that the controversy has largely been reduced to a discussion of the respective merits of the battleship and the submarine. The share which aircraft are likely to take in the naval battles of the future, he points out, is ignored or dismissed with little more than a reference. Admiral Hall, after pinning his faith to "thoroughly efficient air, submarine, and mining services," concludes his views with the very emphatic pronouncement: "It is air mastery alone that can give us the power of a vigorous offensive."

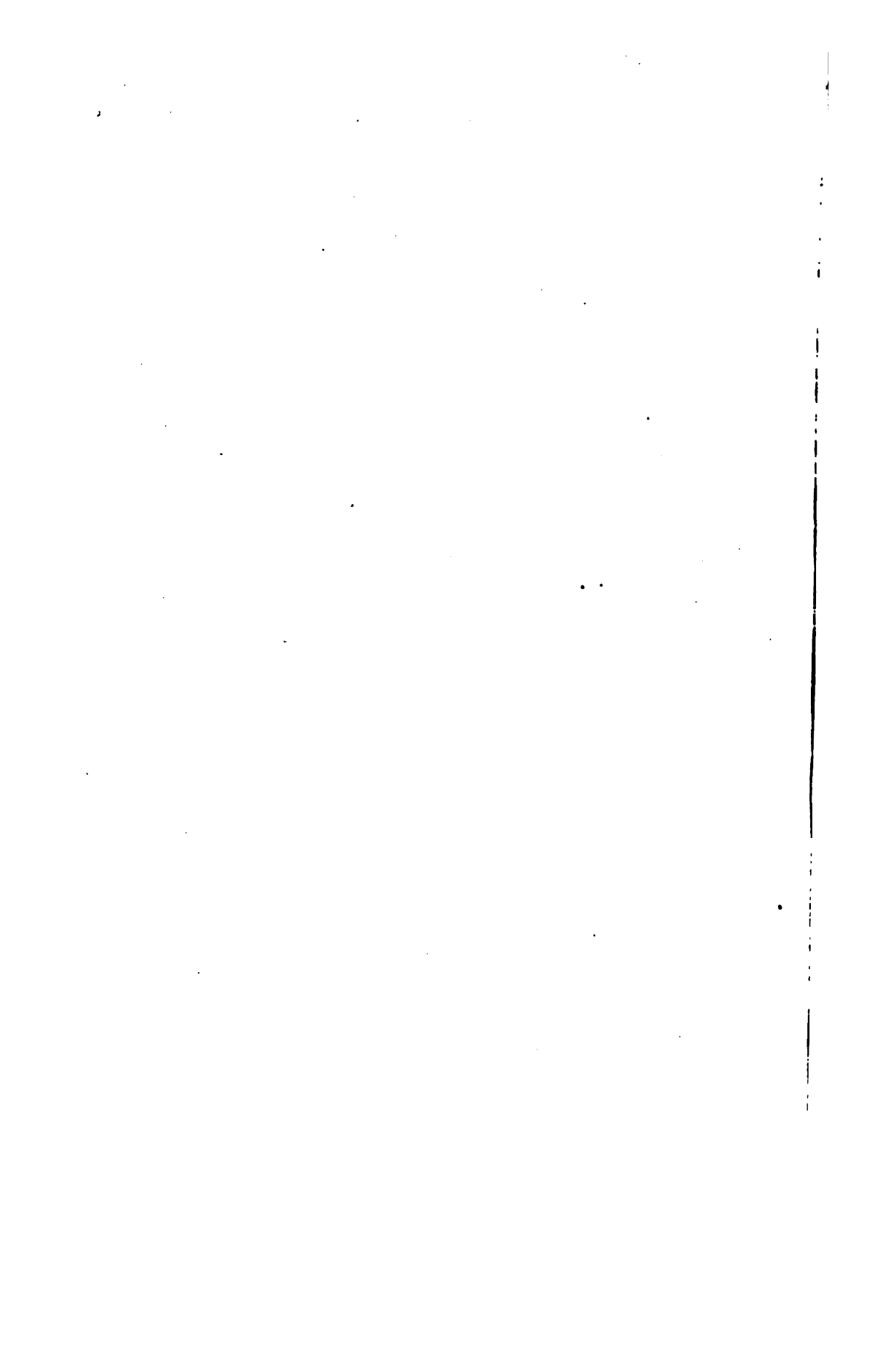
Gen. Brancker sums up the case quite well when he says—also in the Times—after reviewing the claims made by all sides: "Some writers have stated that the duty of the fleet is to destroy the enemy's sea bases, coaling stations, fortifications, and commercial harbors, and others have contended that submarines have rendered such enterprises impossible. But they will not be impossible to aircraft, and I am certain that, in the future, the air force must become par excellence the arm of offense against hostile commerce and territory. If this high allotment to the air renders the allotment to the Navy insufficient for the construction of capital ships, then they must go. No nation can neglect power in the air in order to preserve a form of defense so expensive in its maintenance and so problematical in its utility."

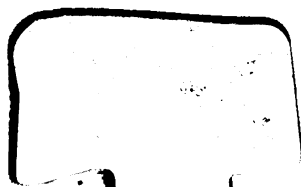
Naturally, we incline very much to the indorsement of Admiral Hall's and of Gen. Brancker's views, and we believe that before many decades there will be few who will not be of the same way of thinking.

By the way of a last "view" of the future the following sentence from a New Year's article in the German paper, *Die Woche*, should give food for reflection:

"The capability of ships to submerge marks a new era in the waging of warfare which is of the highest importance. It can never again be left out of calculation, any more than can the mastery of the air by airships and airplanes."

It would really seem to us that the matter has now arrived at a stage when it can best be judged by an able civilian committee, capable of sifting the whole of the evidence, etc., free from professional bias, and qualified to arrive at reasoned conclusions, which must be forced upon the professional seamen whether they agree with those conclusions or not.





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